# Railroad Age Gazette

INCLUDING THE RAILROAD GAZETTE AND THE RAILWAY AGE

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The approaching forty-second annual convention of the Master Car Builders' Association suggests the question of replacing broken knuckles with those made in foundries foreign to the coupler. During the discussion of the committee report on M. C. B. couplers, last June, attention was called to several points relating to this topic, including the importance of renewed parts being like the originals; that cheaper parts from outside foundries had caused trouble; that knuckles had been seen of such design that their use would have made the couplers inoperative, and that the use of drop-forged parts, even though of greater cost, was preferable. There seem to be two distinct and equally well-founded viewpoints—that of the manufacturer and that of the consumer. The former in selling his product depends upon its efficient service for its most substantial advertisement and future use. Naturally, he advocates that replacements be made with parts of his own founding, of which the correctness of the design and composition is his vital interest. The consumer, quite naturally also, obtains parts for replacement at the best possible cost figure, and is perhaps usually justified in doing so, since outside foundries should have no difficulty in copying the designs of the original parts. Car department officials have expressed opinions of equal weight both for and against knuckles made by outside foundries. Replacements with parts of the original make only would make it necessary to keep an extensive stock of these parts on hand at repair points.

## COMPARATIVE COST OF REPAIRING STEEL AND WOODEN CARS ON THE HARRIMAN LINES.

The record of comparative cost of repairs to steel and wooden cars on the Harriman Lines, which was begun in September, 1904, was closed at the end of the third year. This was a long period to yield accurate and conclusive results, and there was, therefore, no need of continuing the work. These records were published from time to time in the *Railroad Gazette*, the last being June 14, 1907, which gave the results for two years and a half. Below are the figures for the last nine months of the period, which overlap the previous figures three months:

| | Steel cars | | Wooden cars | |
|---|---|---|---|---|
| | Average No. of cars. | Av'ge cost per car. | Average No. of cars. | Av'ge cost per car. |
| January | 11,204 | $4.83 | 10,446 | $5.61 |
| February | 11,205 | 2.92 | 10,441 | 3.92 |
| March | 11,204 | 2.95 | 10,431 | 4.35 |
| April | 11,205 | 3.49 | 10,424 | 4.74 |
| May | 11,201 | 4.02 | 10,419 | 5.06 |
| June | 11,199 | 3.21 | 10,216 | 5.29 |
| July | 11,193 | 3.54 | 10,204 | 5.69 |
| August | 11,190 | 3.08 | 10,203 | 5.70 |
| September | 11,185 | 3.34 | 10,389 | 5.58 |

It will be remembered that the cars included in this record comprised all those of steel or composite construction on the one hand, as against an approximately equal number of wooden cars of about the same age and capacity, and therefore fairly comparable. The average monthly cost for the steel cars for the three-year period was $2.89 and of the wooden cars $4.24, the difference amounting to 47 per cent. of the cost of repairs to the steel cars. The average total yearly saving on the steel cars was $147,037, which, capitalized at 4 per cent., gives $3,675,925. At $1,200 a car this would buy over 3,000 new steel cars.

In connection with these figures on the cost of maintenance of steel and wooden cars it is of interest to know what the results have been with the all-steel box cars of the Union Pacific, which have been in service now for more than a year. One of the features of this design which was criticised at the time the drawings were published was the thickness of the side plates. Two cars were built, which differed somewhat in details of design. It was the desire to test these two thoroughly in service in order to develop any weakness or other bad features before additional cars were built. Mr. Kruttschnitt gave instructions to put the cars in the roughest service existing on their lines. They were accordingly put to carrying bulk coal. Their nominal capacity is 100,000 lbs., and by "shaking down" at the mines it was possible to load 90,000 lbs. of coal into them. A severer service test of the sides could hardly be devised, the brake applications and starting and stopping causing side pressures and stresses from load shifting far in excess of anything the cars would be sub-

ject to in ordinary service. They stood several weeks of this treatment without apparent bad effect.

They were sent to the Southern Pacific Lines for service across the desert country, where the temperature in the summer months gets as high as 130 deg. This was to determine whether the metal bodies would heat to a degree that would be injurious to the lading. No complaint was ever made by shippers, so it is quite safe to say there were no bad results. These cars are two tons lighter than the Harriman Lines' standard wooden car of the same capacity. Mr. Kruttschnitt estimated what the yearly saving per car in operating expenses would be due to this reduction in weight. On the Southern Pacific the average miles per car per year is 10,000, which would give a reduction of 20,000 gross ton-miles for the lighter car. At Southern Pacific unit operating costs this would mean a yearly saving of $24 a car. On the Union Pacific the saving would be $21.60, for while the car miles per year are higher, the unit operating costs are less.

## CAR CLEARANCES.

Several years ago* we published a composite clearance limit diagram of the principal railroads in the United States. This was made up from the actual striking contours of permanent way and structures on over 40 roads. The diagrams we now publish on another page are not directly comparable with the former one because they show, instead of actual striking points, the minimum clearances of cars and which can safely move over these lines. In other words, the present diagram allows for the length of cars and the amplitude of their rocking. The figures taken are those given in the April, 1908, issue of *Railway Line Clearances and Car Dimensions*, and only 90 of the larger standard gage roads were considered. Several of the smaller standard gage and certain narrow gage lines have clearances much smaller than those shown.

The heavy outer line shows the clearance on those main lines which are most likely to be parts of through routes, while the inner light line shows the minimum clearance on branches and other lines where most of the traffic is local. The clearances are those of cars of usual length. On certain lines cars measuring over 45 ft. center to center of trucks exceed the clearances given in the diagram of through lines. For example, on the Central of New Jersey's main line, the maximum width for cars not exceeding 64 ft. in length and 45 ft. center to center of trucks, is 10 ft. 3 in., while that of a car not exceeding 78 ft. in length and 55 ft. center to center of trucks is only 9 ft. 11 in. The 10-ft. width limit is found on a number of roads, and the same is true of the maximum height of 14 ft. 6 in. Perhaps the most important limits are those from a point 14 ft. 5 in. above the rail and 2 ft. from the center line to a point 12 ft. above the rail and 4 ft. 9 in. from the center line. The limits on the line between these points are fixed by several roads. Box cars built according to the American Railway Association standard inside dimensions would not clear this line, as they would be about 9 ft. 7 in. wide at heights from 12 ft. to 12 ft. 6 in. above the rail, depending on whether low or high floors were used. The clearance below the car body is, as was pointed out in commenting on our former diagram, dangerously close to the journal boxes on large journals and also to low arch bar trucks. It is also obvious that current collectors used on cars used on electrified lines would project out on the side beyond this clearance line. There are a number of main line limits which have been omitted from the diagram because they would not necessarily cause trouble with the interchange of cars, since they are at such points that cars could escape them by making very short detours. In the Minneapolis & St. Paul freight yard at Minneapolis, between the depot and Knoblaugh, the maximum height allowed is 13 ft. 10 in. Two of the Michigan Central car ferries allow a height of only 13 ft. 8 in. at a width of 5 ft. In the St. Clair tunnel of the Grand Trunk, the maximum height at a width of 3 ft. is 14 ft. The Wisconsin Central allows a width of only 9 ft. 8 in. between Randolph street, Chicago, and Franklin Park; also between Troutbrook Junction and the Minneapolis freight depot, and between the St. Paul freight depot and the Minneapolis freight depot.

Of the lines which go to make up the local clearance diagram, several show a maximum height of 14 ft. The maximum height on the West Virginia division of the Western Maryland is only 13 ft., but this is omitted because it is so much lower than that of any other road of those selected that it seems that the diagram will give more information if this limit be left out of the diagram and merely noted here. The limits from a point 3 ft. from the center line to a point 4½ ft. from the center line are fixed by the Cincinnati, Hamilton & Dayton, and are nearly all several inches less than any other road. The maximum width, 9 ft., is found on a branch of the Seaboard Air Line. A short stretch of track in Long Island City, on the Long Island Railroad, allows a width of only 9 ft. 2 in., and there are several roads whose limit is 9 ft. 6 in. Many of the minimum points on this diagram are fixed by obstructions on quite small branches of large roads. These branches, of course, may not be used by cars of other roads nearly as much as are the main lines of small roads which we have left out. Some of these smaller roads, as we have mentioned above, have limits much less than those shown in the diagram. On the Texas Central the maximum height is 11 ft. 2 in., and near Olean, N. Y., on the Pittsburgh, Shawmut & Northern, there is a limit of 11 ft. in height.

*Railroad Gazette*, June 17, 1904.

## THE DISPOSITION OF LIGHT FREIGHT CARS.

The committee on freight equipment of the Rock Island Company, which was appointed in 1905 to make a careful study of the condition of cars and make recommendations looking to increasing their capacity and usefulness and the prolongation of their life, as well as prepare standard designs, expressed the opinion that all equipment of less than 60,000 lbs. capacity, because of age and light construction, was unsafe to run in present heavy trains "owing to its liability to have the draft rigging pulled out or the sills broken, permitting the car to buckle up or break down when placed between modern high-capacity cars, thereby causing damage to other cars as well as an interruption to traffic by the wrecking of trains." Another important reason was that the ratio of revenue-earning load to dead weight hauled was too low for economical operation. The records showed that the maintenance of these cars formed the principal item of expense in the repair account. The committee therefore recommended the retirement from service of such equipment when its condition required repair costs in excess of certain stated amounts which were given in tabular form for all of the cars represented. Both the Rock Island and Frisco systems have since been retiring these cars in accordance with these recommendations.

The Atchison, Topeka & Santa Fe has a different policy, which is described elsewhere in this issue. Briefly, it is the application to these cars of a steel sub-frame, which goes beneath the wooden underframe, without change to the latter, and gives continuous steel draft sills to resist the service stresses so destructive to the unprotected light wooden equipment. Stronger draft gear is applied, and the trucks strengthened to carry a heavier load, the capacity of the car being marked 10,000 lbs. higher than before. The net increase in weight is 1,500 lbs., so that the ratio of dead weight to paying load is decreased about 10 per cent. Only cars 34 ft. long and over are being thus retained. The Santa Fe has considerable demand from shippers for such cars, and as the equipment on hand was good for 10 or 15 years more when treated as described, the expenditure thus made seemed amply warranted on economic grounds.

The Santa Fe is the only road we know of that is doing this.

Other large roads are retiring this old light-capacity wooden equipment after some such plan as the Rock Island-Frisco lines; that is, when the estimated cost of repairs to a car exceeds a certain amount the car is scrapped or otherwise disposed of. While this limit varies somewhat for different roads, it averages around $75, the age and capacity of the car both being determining factors. More money will be spent on a 50,000-lb car, for example, than on a 40,000-lb., though both sizes are being got rid of as fast as conditions warrant. On the Harriman Lines, with a total of 68,000 freight cars, due in part to the gradual elimination of light equipment, the average capacity has risen from 22 tons to about 34 tons in the last ten years, an increase of over 55 per cent. These lines had at the end of the 1907 fiscal year 4,461 40,000-lb. cars and 10,178 50,000-lb. cars, which will be broken up or otherwise retired as fast as possible, leaving the minimum at 60,000 lbs.

There is a sentiment on a good many roads against accepting these light capacity cars in interchange. Such of these roads as still have a good many of these cars try to keep them on their own lines, in local service, as much as possible. The present limit of the Master Car Builders' Association for cars which may be offered in interchange is 30,000 lbs. Some roads would like to see this 50,000 lbs., at least. An effort was made this year to have the M. C. B. minimum raised to 40,000 lbs., but the arbitration committee disapproved the recommendation. The objections of the high-capacity-car roads to accepting these small light cars in interchange is due not only to their physical frailties and the troubles they may cause in trains of heavier equipment, but they cost as much in per diem charges as cars of double the capacity. To the per diem rule all cars look alike. The 40,000-lb. car is worth as much as its 100,000-lb. brother. Therefore a transcontinental road which is offered two loaded 25-ton cars for a through run, would be money ahead by reloading the contents into a 50-ton car, saving not only the per diem on one car for the haul both ways, but also effecting a considerable operating economy in the reduced drawbar pull and ratio of dead weight to paying load.

The larger roads get rid of a good deal of this equipment by selling it to smaller roads. That is, the ownership passes. As a matter of fact, they are not rid of the equipment by any means, for it is put in interchange traffic by the new owner and comes right back on the lines that have discarded it, giving even more trouble than before, for it is then entitled to the care which must be accorded to all foreign equipment under the interchange rules. For this reason we understand that some of the roads have ceased to dispose of these cars in this way, preferring to destroy them instead.

The policy of eastern roads is similar to those of the west. The Pennsylvania considers 30-ton capacity cars as the minimum ones to be retained in service. Thousands of the old 20-ton and 25-ton cars have been destroyed during the past few years. The maximum cost of repairs per car is about $70, even for the 30-ton cars, and these are scrapped if the apparent repair cost is higher than this. These lines have experienced considerable trouble with light capacity foreign cars. The Central of New Jersey considers 20-ton cars of sufficient capacity to be retained, although this equipment is often reinforced in the draft gear to withstand handling in heavy car trains.

## CARS FOR THE VIRGINIA COAL BUSINESS

We print this week an outline of the cars that are used for the transportation of the same commodity, coal, over a distance of approximately 400 miles, on three parallel lines from the mines to the sea. There is little or no difference in the conditions of mining along the three lines. The coal does not differ very much in quality, and yet there appears in the youngest of the three lines a development of the use and construction of the car that is worthy of consideration. All use the car of 100,000 lbs. capacity, which may now be considered as the standard for the movement of low-grade bulk freight on American railroads. When these heavy cars were introduced they soon earned the sobriquet of "battering rams" or "battleships" because of their effect upon the cars of lighter capacity placed next them in the same train, and it was tacitly accepted as a valid excuse for the injury to a weaker car that it was crushed by switching with steel cars.

It so happened that the introduction of the automatic coupler and the enforcement of the law regarding the work of the trainmen between cars was synchronous with that of the steel car, so that the engineman suddenly found himself relieved from the responsibility of bringing cars together at a low speed because of the presence of a man between them, and was given a most powerful agent of destruction to execute the results of any carelessness of train handling of which he might be guilty. It appears that the immunity from censure that he enjoyed, because of the comparative weakness of the earlier cars, has bred a disregard for all of the rules of careful handling, and this disregard has been cultivated in the extreme by the hump yard and the smashing incident to its high collision speeds until now we have a widespread and well-founded complaint of the constantly increasing cost of car repairs.

A part, possibly a large part of this, is due to the speed with which the work must be done, and speed in the classification yard means high velocity and sudden stops or impacts of car upon car of some severity.

As the manufacturers of armor plate and of armor-piercing shell are constantly vieing with each other for supremacy either to resist or to pierce, so the car builder and the traffic department seem engaged in a rivalry to smash the car or build one that is smash-proof.

But the car must now be built not only with a capability of withstanding the rough treatment to which it may be subjected while moving about on its own wheels, but must be so built that it can go through the gymnastics and none too gentle manipulation of being picked up, turned over, and then of carrying an equivalent to its whole load on the top edges of its sides. This may not be railroading, and certainly is not a performance that was contemplated when the first cars were built, although it is a feature of operation that has proven so satisfactory on the lakes that it seems strange that it has not appeared before on the seashore. But now that it is about to be used by the Virginian Railway it is probable that the example will be followed by other lines when enlargements or new terminals are constructed. It is significant, however, to note that this use necessitates a radical change in the design and distribution of the strength of the car framing. In short, the body must be capable of lying upon its side or standing on the edges of its sides under a full load without distortion of metal or injury or loss of parts. Such a car must, of necessity, have greater all around qualities of resistance than its older fellows of the same capacity, and it remains to be seen whether the transportation department will be capable of so restraining the energies of its employees that the current complaint regarding increased cost of car repairs can be overcome. A recent paper before the New York Railroad Club called attention anew to the energy of impact and it is easily calculated, but a trip through the repair yards will give the veriest layman an idea of what this means in the destruction of property better than any written description.

Cars are necessarily being made stronger and heavier to meet ordinary traffic requirements, and this is well exemplified by the examples given elsewhere. When some of these cars were designed the idea was to obtain as light a car as possible with the required capacity, and at the time this served well, for they were brought in contact, for the most part, with other cars lighter than themselves, but now they are below the latest standards of strength and are suffering in consequence.

There is another point that appears in these designs, and

that is the tendency, slight to be sure, toward the use of structural shapes. The standard truck for all of them is of the diamond type, and although many other designs have been thoroughly tried this appears to be the only one that has survived the stresses of service and to have more than held its own. In the light of present designs and proportions, it seems that its apparent loss of prestige a few years ago was due to the failure of the railroad men to appreciate the necessity of strengthening its parts with the rapidly increasing car capacities and the alertness of the manufacturers of special designs of trucks to meet the demands of the heavier service. But the cheapness and simplicity of the diamond truck brought it again into favor, when it was given bolsters and arch bars proportioned to the new loads to be carried, and when it was realized that 4-in. by 1-in. bars were not the sizes to be used in modern cars.

In the examples of coal cars offered those at work on two of the roads are giving satisfactory service, but that service is not so severe as that which will be required of the cars of the latest design. In the first place the trains are about 25 per cent. shorter than that which is proposed, and the terminal work is easier if we bar the switching service. It will be interesting to note the manner in which this latest development of the high capacity steel car will meet the increased severity of its service or whether the shells of the traffic department will be given such an extra temper and increased velocity that the greater resistance of the car's armor will be pierced and the same old conditions prevail. If such should happen to be the case there would simply be another point added to the argument of those who are calling for better discipline and a greater regard for the value of property by the men upon whom the work in the yards devolves.

## LETTERS TO THE EDITOR

### Disappearance of Old Freight Cars.

New York, June 6th, 1908.

To the Editor of the Railroad Age Gazette:

The article entitled "Comparative Summary of Freight Cars in Service on the Railroads of the United States" in your issue of 5th inst. contains the very striking statement that something like 300,000 freight cars have disappeared in the last seven years.

Some time ago figures were drawn off to show the numerical deficiency in the rolling equipment of the railroads for the year 1906 based on the equipment in existence in 1898 and the equipment built from 1898 to 1906 inclusive. The figures used in making this comparison were for the equipment in existence in 1898, the report of the Interstate Commerce Commission; for the equipment built since 1898, the compilation of the *Railroad Gazette*, and for the equipment in existence in 1906, a pamphlet prepared for the General Managers' Association of Chicago by Mr. Slason Thompson, in which he states he used the *Railroad Gazette* figures up to 1905 and estimated the figures for 1906. The conclusion arrived at from these figures was that from the 30th of June, 1898, to the 30th of June, 1906, 17,137 locomotives, 8,014 passenger cars and 661,787 freight cars had passed out of existence. The percentage increase in locomotives, passenger cars and freight cars in existence in 1906 over 1898 was for

| | | | |
|---|---|---|---|
| Locomotives..... | 36 | Freight cars ..... | 25 |
| Passenger cars..... | 21 | | |

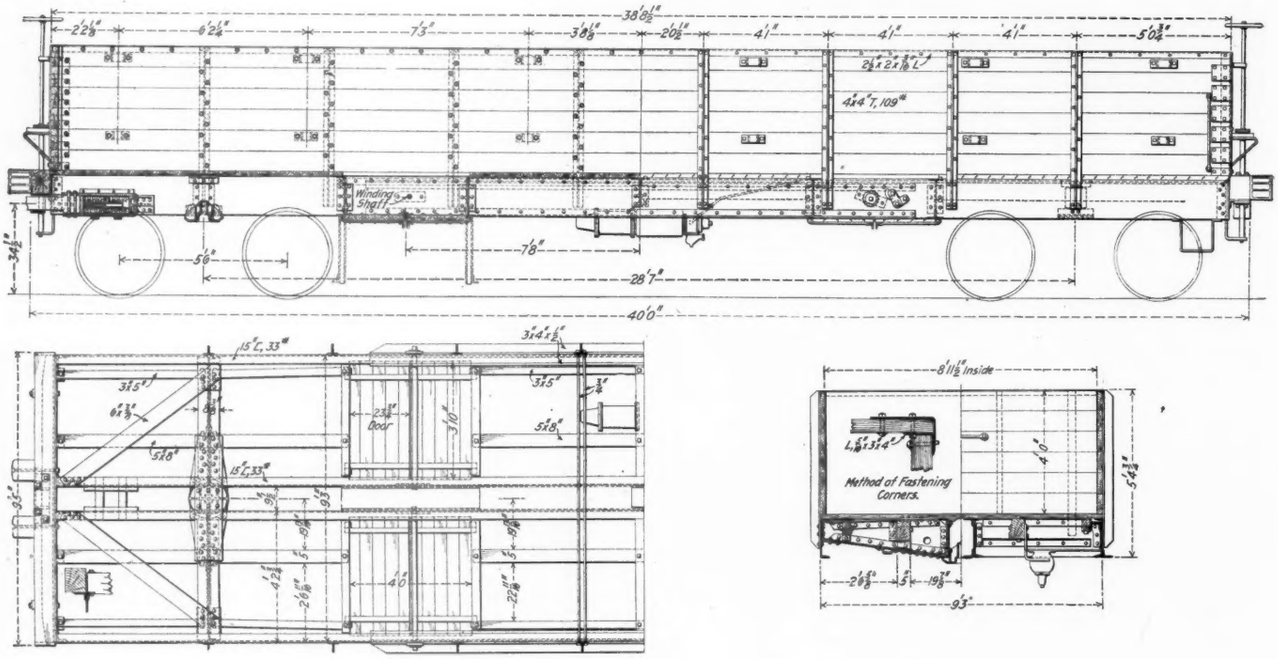
It seems to be pretty generally overlooked that the practice of allowing the number of cars to decrease and compensating in carrying capacity by increasing the size of the cars, by no means takes care of the developing interests of the country in the direction of location, number and variety. It is probable that the kernel of the violent agitation relative to car shortage witnessed all over the country up to last October lies in the erroneous reasoning which gave birth to the practice.

SCRUTATOR.

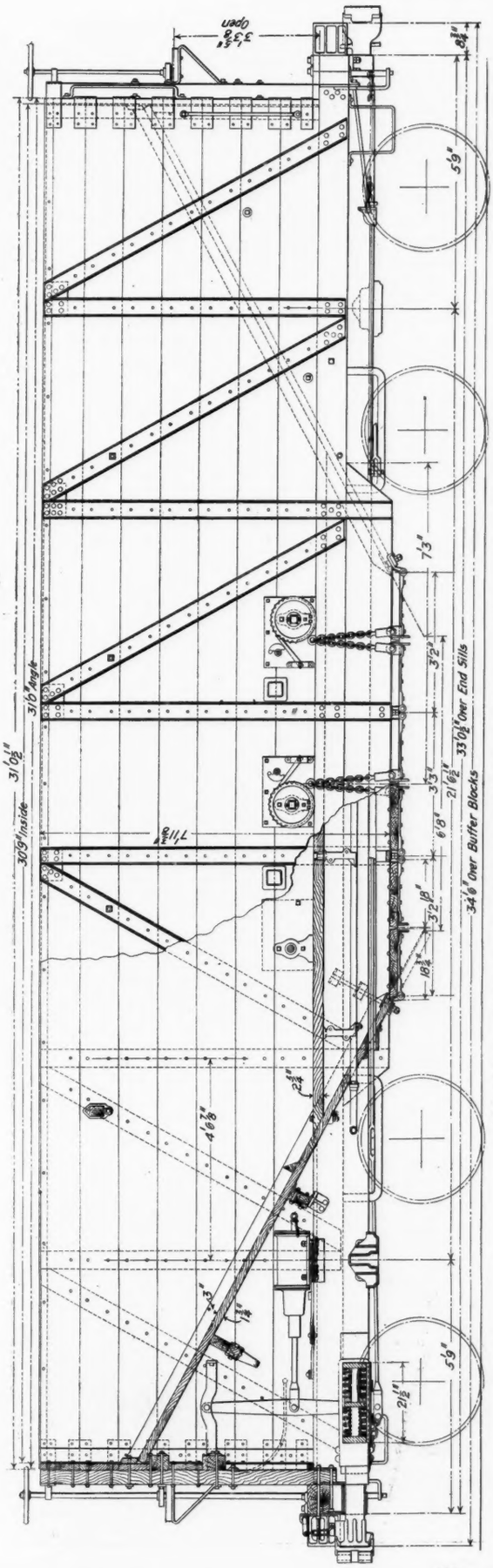
### Norfolk & Western Coal and Coke Cars.

In the Norfolk & Western coal trade, like that of the Chesapeake & Ohio, two classes of cars are used: one a drop-bottom gondola for western trade and the other a high hopper bottom car for tidewater business. The gondola is sometimes modified by the addition of a rack for carrying coke. The G I gondola, as it is known, has a capacity of 100,000 lbs. and is built with steel underframing, a structural bolster and fixed ends. The length over the end sills is 40 ft. and the total width is 9 ft. 11 in. The length over the body is 38 ft. 8½ in. and the trucks are spaced 28 ft. 7 in. center to center.

The underframes are built-up of structural shapes. The center and side sills are of 15-in. channels weighing 33 lbs. to the foot. The center portions of these members are reinforced with angles riveted for 18 ft. to the bottoms of all channels and the tops of the side sills; for the top reinforcement of the center sills, this angle extends 19 ft. 10½ in. The angles used are 3 in. by 4 in. by ½ in.




Fifty-Ton Drop Bottom Gondola, Class G I; Norfolk & Western.




100,000-lb. Steel Frame Hopper Bottom Gondola; Norfolk & Western.

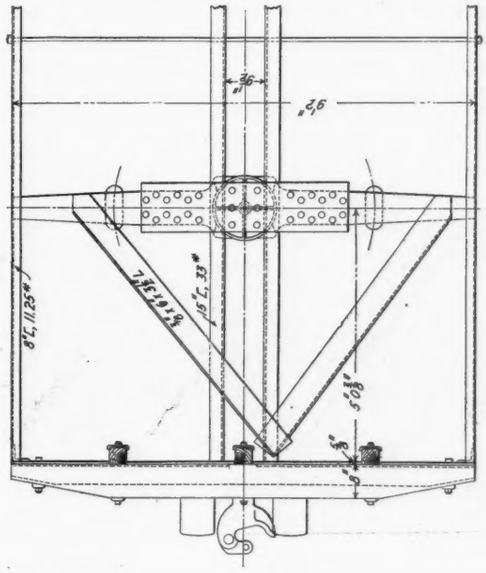
The bolsters are also built-up, being formed of steel angles and plates. The plate is held to the center sills by vertical angles and is stiffened at the top and bottom by angles. The angles used for a connection with the center plate are fitted in between the flanges of the channels by grinding the corners. The stakes, 12 in number, are 4 in. x 4 in. T's, and are riveted to the side channels. The side and end boards are of wood bolted to the stakes. There are four drop doors, as indicated by the engraving.

In addition to the bolsters, there are five other cross-ties, between the sills, one on each side of each drop door and one in the center of the car. These are built up of plates and angles. To reinforce the strength of the center cross-ties, the two stakes at the center are tied together directly across the car immediately above the sills by two ¾ in. rods, as shown. The riveting is all done, with a few exceptions, with ¾-in. rivets driven in holes $\frac{1}{16}$ in. large.

The end and side planks are of Georgia long leaf yellow pine 1¾ in. thick, and are capped with a coping angle 2 in. by 2½ in. by $\frac{3}{16}$ in. that extends the full length of the top and is riveted to the stakes. The doors are also of yellow pine, ship lapped 5¼ in., and are fitted with hinges passing the full width of the door and reinforced on the top side with a wrought iron strap. They are operated independently by winding shafts that have bearings in the center and side sills and are secured with ratchets and pawls. The flooring is also of yellow pine of the same thickness and ship lapped.

The steel work is confined to the bolsters, cross-ties, longitudinal sills and stakes. The end sill is of oak, to which the buffer blocks and coupler attachments are fastened. It rests on an angle which extends its whole length and thus adds very materially to the transverse stiffness of the member. At the same time, the cushioning effect of the wooden end sill is obtained back of the buffers. It is well supported, as will be seen, not only by the center sills but also by diagonal braces running from the outer ends of the bolster to the end sill at the center. These diagonals are of 6 in. by ⅜ in. plates. In addition to these there is an intermediate sill extending the length of the car but interrupted at the door openings.

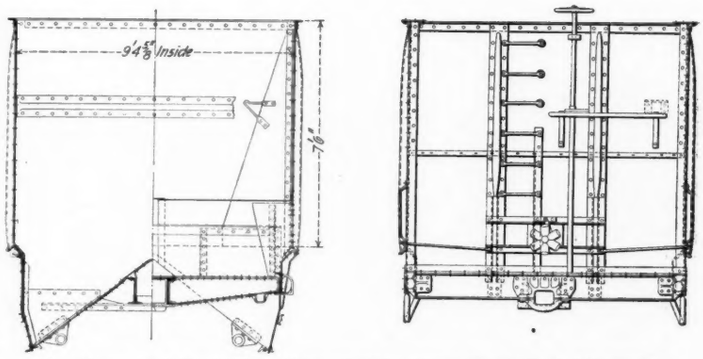
The drawbar follower stops are riveted directly to the center sills, and are arranged for the Butler draft gear. Top lift automatic couplers are used, with the drawbar arranged for a pocket strap. The Barber truck is used, having a 5-ft. 6-in. wheel base, 6 ft. 4 in. center to center of arch bars. The column bolts are held at the top by malleable iron washers, which hold them in place and at the same time furnish a slight countersink for the column bolts. The spring plank is a 12-in. channel weighing 25 lbs. per foot, and the Barber rollers are between the spring plank and the bottom spring seat. The bottom spring seat is of malleable iron and the rollers of chilled cast iron or rolled steel. The bolster is composed of two 10-in. I-beams weighing 35 lbs. to the foot, to which a $\frac{5}{16}$-in. cover plate is riveted at the top and bottom.



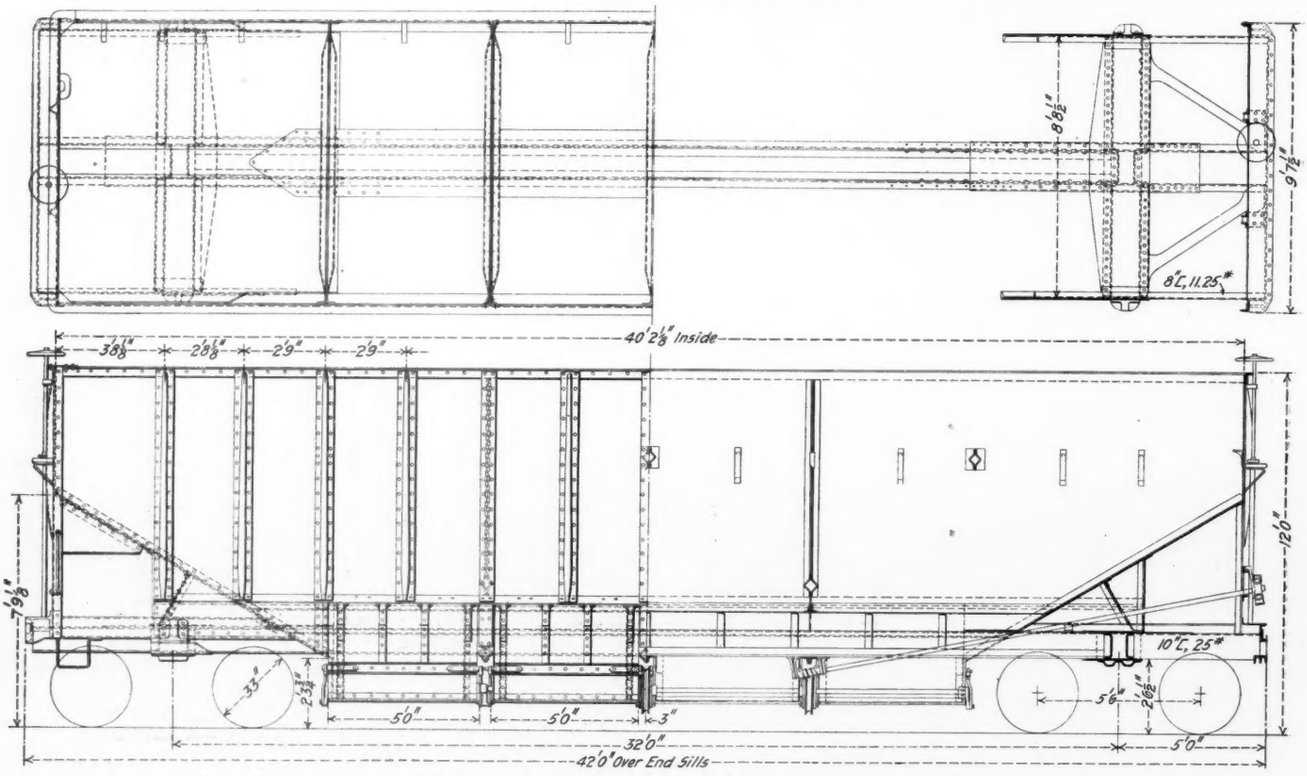

Underframe at End of Car.

A malleable iron casting is riveted between the I-beams at each end which forms, in combination with a wooden block, the support for the top spring seat. The center plate, side bearings and dead lever guide bracket are riveted to the top of the bolster. Guides are riveted to the webs of the I-beams for preventing any lateral movement of the bottom spring seats. There are also stops for limiting the lateral movement of the bolster. The spring suspension consists of seven double helical springs, and the wheels are M. C. B. standard 700-lb. pattern, 33 in. in diameter.

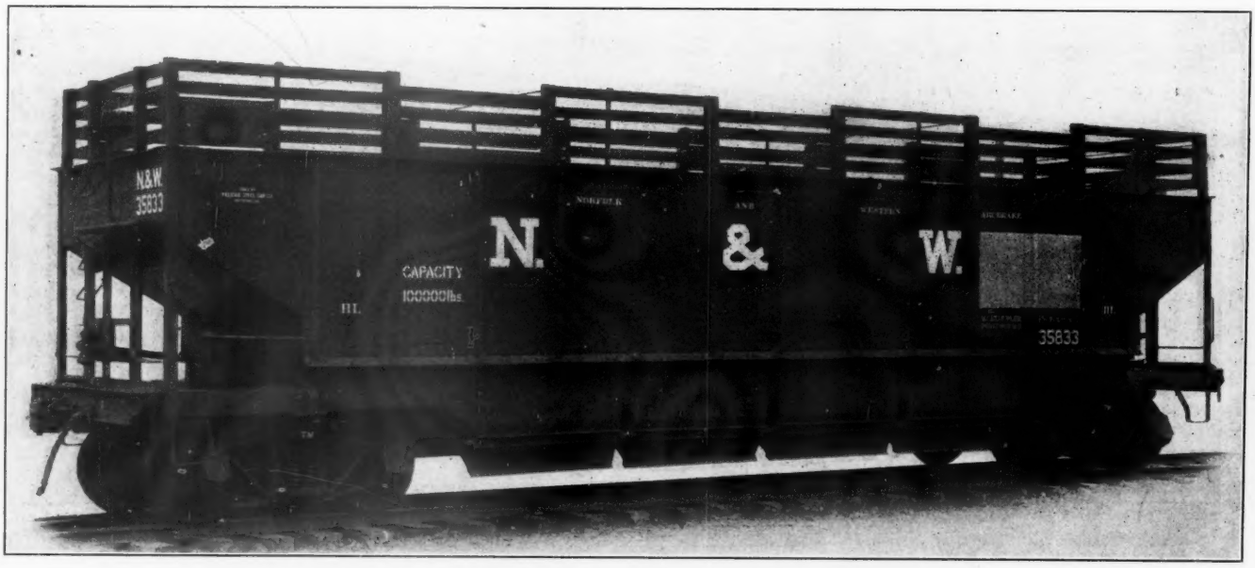
These G I gondolas are converted to coke cars by the addition of a rack that is bolted in stake pockets and to the inside of the siding. When in place, the top is 13 ft. ½ in. above the top of the rail. It is formed of wooden stakes tied across at



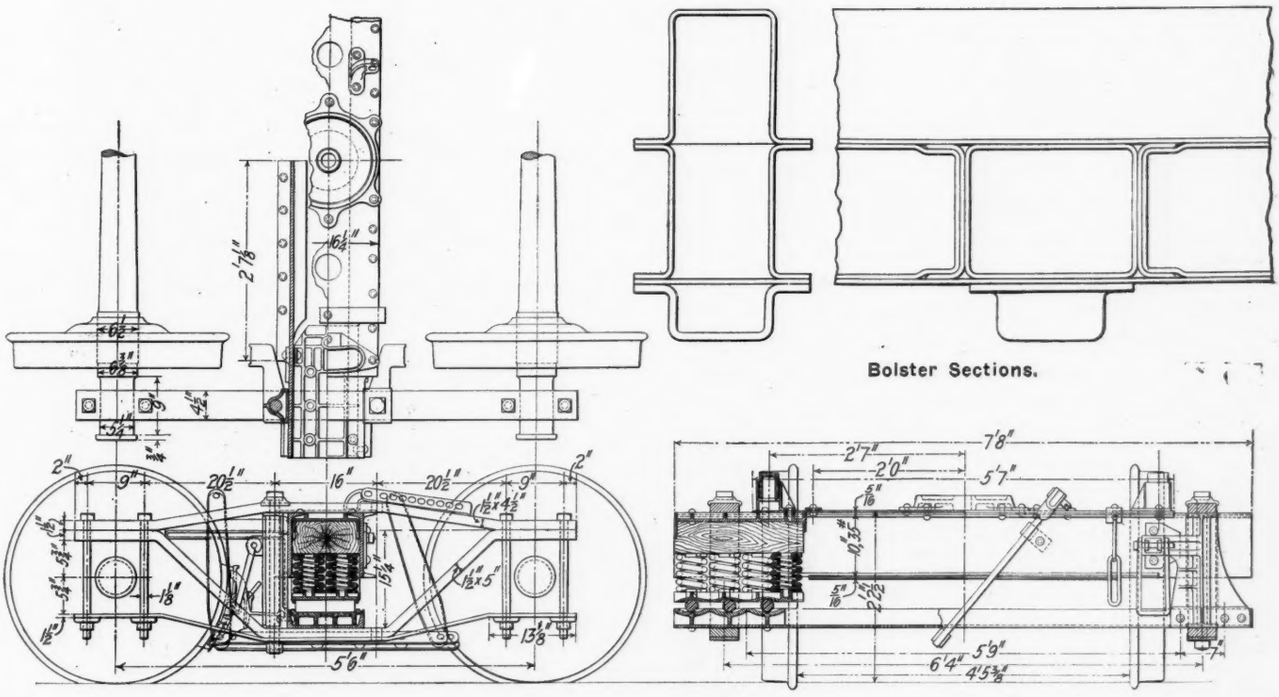

Sections and End Elevation of Coke Car; Norfolk & Western.



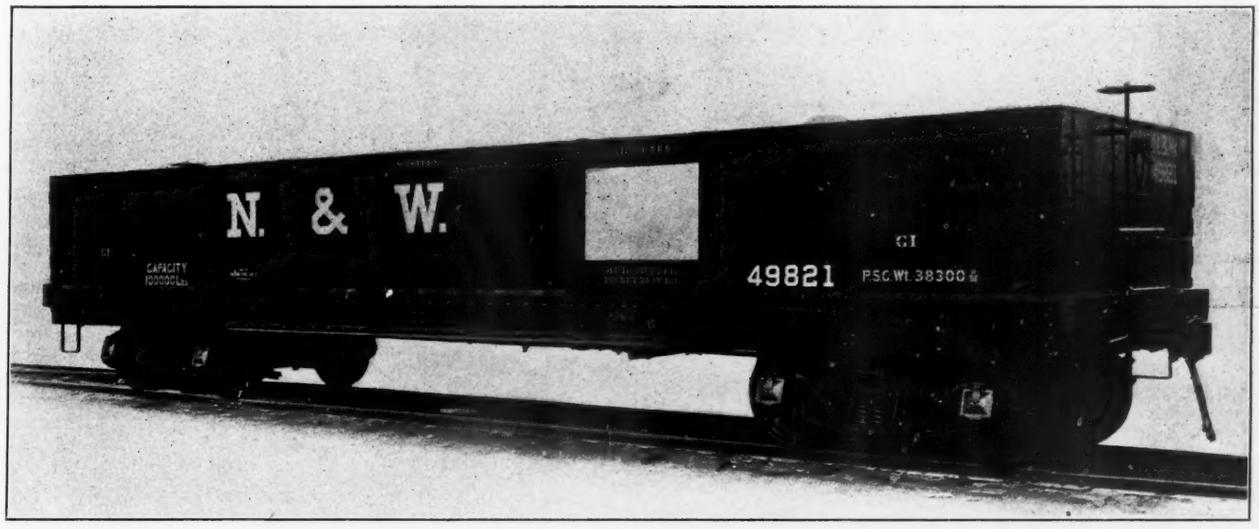

100,000-lb. Steel Coke Car; Norfolk & Western.



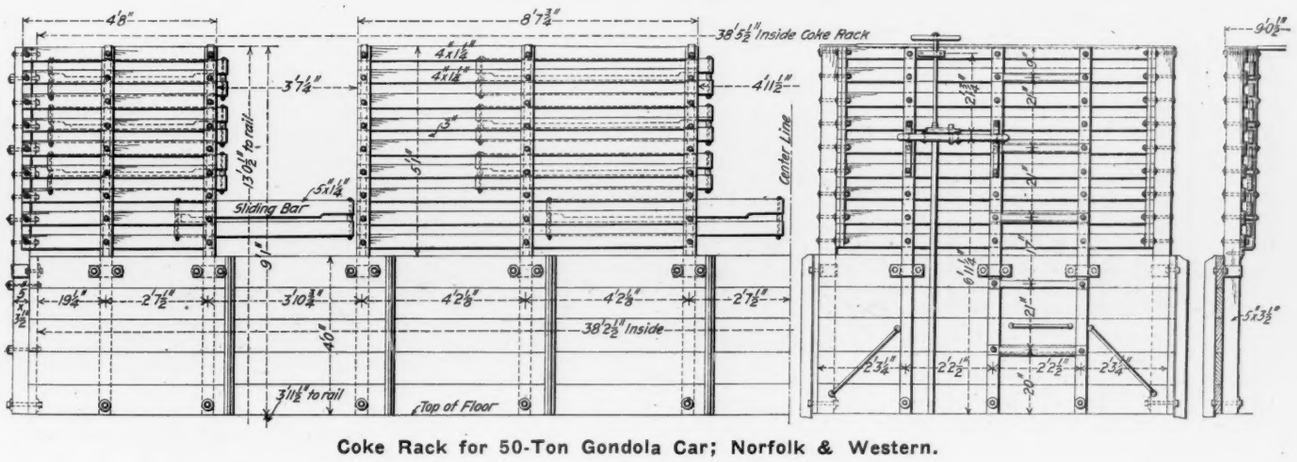

Coke Car; Norfolk & Western.




Barber Truck for 100,000-lb. Cars.




Steel Underframe Gondola; Norfolk & Western.




Coke Rack for 50-Ton Gondola Car; Norfolk & Western.

the tops with rods that are flattened at the ends so as to be bolted in place. The width of the rack over all is 9 ft. ½ in. The boards of the rack are 4 in. by 1¼ in. and stand 3 in. apart. At the center and at 4 ft. 8 in. from the end there are openings like door openings which are closed by sliding slats moving in pairs so that the coke can be removed from either side without having to take it out over the top of the rack, or trying to make it flow through the door openings in the floor. These side openings make the sections of the rack so short that they are readily handled and the cars can, therefore, be quickly altered for carrying either coke or coal.

Another car that has been used very successfully for the shipment of coke on the Norfolk & Western is of steel construction with side discharge hoppers. It is used especially for the western trade and shipments to the furnaces. It is of same construction as that used on the Pennsylvania, and has an underframing composed of both structural and pressed shapes. The center sills are 10-in. channels weighing 25 lbs. per foot and extend the whole length of the car. These are reinforced along the lower edge between the bolsters by 3½ in. x 3½ in. x ⅝ in. angles. The side sills extend from the corners toward the center to the point where they meet the slope of the floor above the inner truck wheel. The end sill is a 10-in. channel weighing 15 lbs. per foot. The bolsters are formed of two pressed steel diaphragms on each side fitted into the sill channels and held by top and bottom cover plates. The sides are of $\frac{5}{16}$-in. plates, riveted to, and stayed by, pressed steel stakes, with a 3½-in. by 3½-in. by ⅝-in. angle coping at the top. They are further stayed at the center and two intermediate points by pressed cross stays.

The discharge is at the sides through four doors on each side extending over a length of 21 ft. 6 in. at the center. They are operated by a shaft driven by a worm that is on an inclined shaft driven from the end of the car. These cars are 42 ft. long over the end sills and are carried on the standard freight trucks for 100,000-lb. capacity cars, set 32 ft. from center to center of bolsters. The inside dimensions are: Length, 40 ft. 2⅛ in.; width, 9 ft. 4⅝ in., and depth, 8 ft. 8½ in. above the top of the sills. The total height of the top of the sides above the rail is 12 ft.

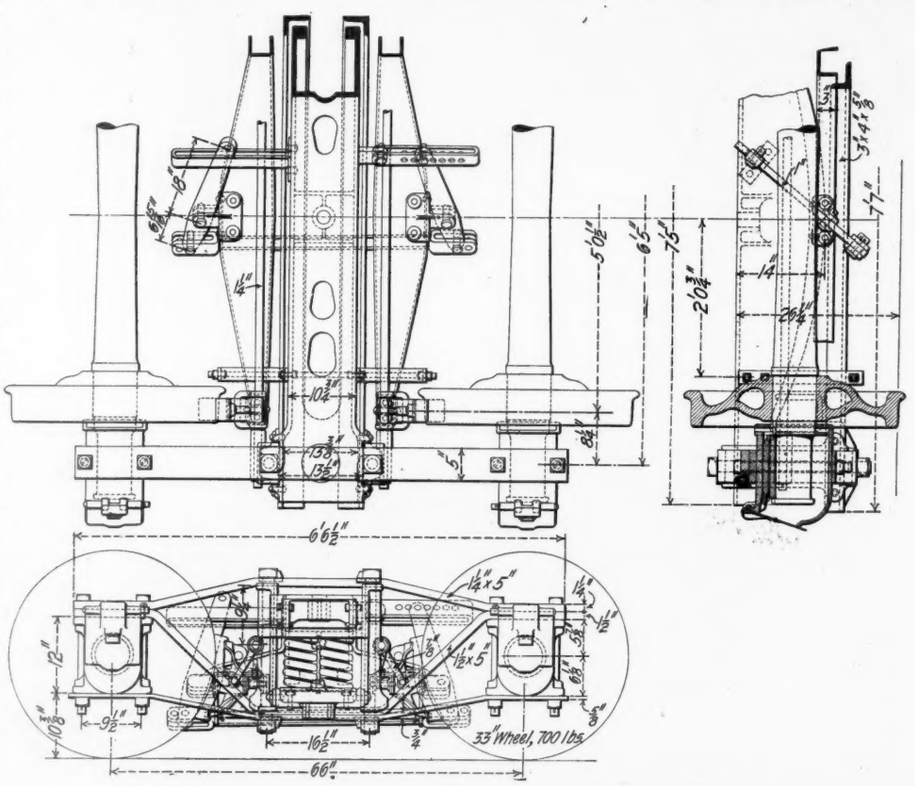
The cars described above are those used, as already mentioned, in the coke and western business. The one designed for, and chiefly used in, the tidewater coal traffic is a hopper bottom gondola of 100,000 lbs. capacity, having a steel frame and a structural bolster. Its principal dimensions are: Length over body, 31 ft. 1½ in.; length over end sills, 33 ft. 1½ in.; width over body (not including stakes), 9 ft. 2 in.; distance between truck centers, 21 ft. 6½ in. The side sills are of 11¼-lb., 8-in. channels, and the center sills are of 33-lb., 15-in. channels. The bolsters are of plates and angles and are built in and riveted to the sills. The stakes and braces are 9-lb., 5-in. channels; they are riveted to the side sills, and bolted to the side boards, with a 2-in. by 2½-in. by ⅝-in. coping angle at the top.

The doors are six in number and have been arranged to meet the requirements of the chutes at the Lambert's Point terminal. They are held by winding chains in the usual manner, with shafts held by a ratchet and pawl.

As in the case of the low side gondola, the end sills are of oak and have buffer blocks with the coupler attachments fastened to them. The drawbar follower stops are riveted direct to the center sills, and the rigging is arranged for the Butler tandem draft gear. The center plates and side bearings are of malleable iron. It is with these cars that the major portion of the Norfolk & Western coal business is handled. At the terminal at Lambert's Point, they are dropped down to the foot of the incline of the coal chutes and pushed up the same by a barney car. They then run down by gravity over the pockets, through a switch and back to the yard, where they are hauled away and made up into trains by the switching locomotives.

### Coal Cars of the Chesapeake & Ohio.

There are two fundamental types of cars used in coal traffic by the Chesapeake & Ohio: the regular hopper bottom coal car and the drop or hopper bottom gondola. As the business has grown and improvements have been made, the details of the construction have been changed; wood has been superseded by steel, and cars of 40 tons capacity have been followed by those of 50 tons, but the general types have remained. These two are intended specifically for the eastern and western trade respectively, though both are used in each direction.

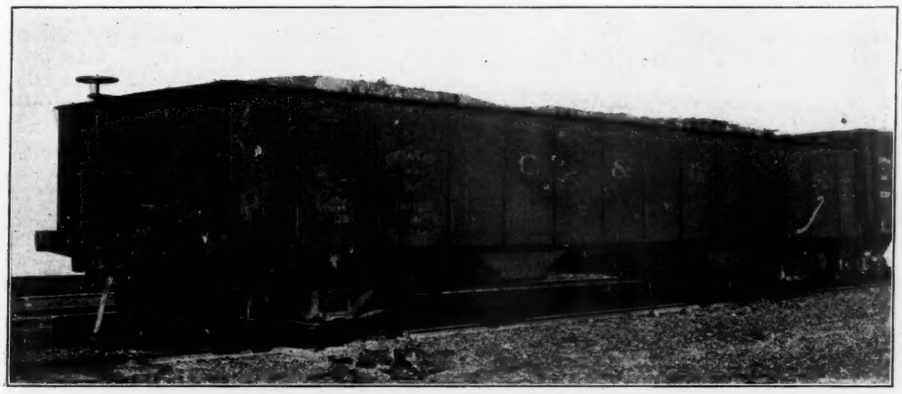



Truck for 100,000-lb. Freight Cars; Chesapeake & Ohio.

The eastbound traffic goes, for the most part, to Newport News, where facilities are provided for handling the high capacity hopper bottom cars, while the drop bottom gondolas are intended to meet the western requirements where the elaborate unloading facilities of the tidewater terminal do not exist. In this article it is to the heavy hopper bottom cars as used in tidewater traffic that attention will be particularly directed.

The first coal cars of more than 60,000 lbs. capacity that were used on the line carried 80,000 lbs. and had underframing of wood. Many of them are still in service. In these cars a single center sill, measuring 9 in. x 10½ in., served as the column to take the buffing stresses and carry the draft rigging. The side sills were 4½ in. x 1½ in., and their vertical strength was supplemented by the side boards and a stiffener beneath, to which a flat truss rod ½ in. x 2¾ in. was added. This truss rod dropped down at a rather sharp angle from the top of the body bolster and was pinned to a 1¼-in. round rod that came out through the end sill, where it was held by a nut and washer. In rising from the bottom of the sides to the bolster, the rod drew in to the center so as to counteract the

tendency of the boards to spring out. This construction makes the whole side a composite plate girder to carry the load. It has been urged that the shrinkage of the wood, and the resultant opening of the cracks would prevent such a side from acting as a unit and that this would so reduce the carrying capacity as to make it insufficient. Such a criticism does not seem to hold, however, with these cars, for there are no complaints of sagging between the bolsters, though there has been some drooping of the ends. This stiffness is brought about by firmly bolting the stakes to the side sill and then bolting on each of the 12-in. side planks with two bolts. The draft rigging of these cars is underhung, and tandem springs are used. The cars are extensively used and are rendering efficient service, but no more are being built, all new equipment being of steel construction.



Drop-Bottom Steel Gondola.

The steel cars are of 100,000 lbs. capacity and are built of both pressed steel and structural shapes. In the case of the pressed steel car, a typical bolster construction may be taken as that built up of two pressed diaphragms made to fit in the U of the center sills, these being, in turn, held together by a pressed steel center piece, and the whole capped by a U-shaped bolster 10 in. deep and made of ⅜-in. steel. This bolster has a width of 8 in. over the legs, the ends of which are flanged out to meet the flanged edges of the diaphragm. At the bottom there is a cover plate beneath which the center plate is riveted. This bolster has gone through a process of evolution, and in the later cars much of the pressed steel work has been eliminated. For example, in the early cars, like those referred to, the center sills were pressed shapes. These have been replaced by rolled channels in the later designs. Then, in order to secure the necessary stiffness of the bolster, a plate girder has been built in over and around the channel center sills. The plate itself is ⅜ in. thick and is stiffened at the bottom with 3½-in. x 5-in. angles with the long leg set horizontally, the whole being stiffened in the center by a cover plate that widens out to 19 in. at the sills. At the top, the plate of the bolster is bent and riveted between two angles that are themselves riveted to the bottom of the slope of the hopper. At the ends, on each side of the center sills, and at the intermediate points on each side, these plates are stiffened by the vertical riveting on of angles. The plate thus takes the form and function of the buckle plates that have come into use in carrying the boilers on locomotives. There is great vertical stiffness to carry the load, but a lateral flexibility to allow for inequalities of lengths. This is, of course, necessary to permit the expansion of the boiler in the case of a locomotive, but is not needed for that purpose on a car, where the longitudinal rigidity is obtained by fastening the lower end of the hopper floor to the sills. At the ends, the pressed steel construction consists of an end sill that serves as a cover plate for the whole of the end of the car. It lips down beneath the sills, comes up over the ends, back over the top for a distance of about 7½ in. and then turns up to be riveted to the uprights for carrying the body at the ends.

The sides are brought down and riveted to the side sills and are stiffened by vertical stakes of pressed steel, which were changed, with a change of building, to channels in the later constructions. The top edge is stiffened by the usual angle. In this lateral construction, too, the side sheets are brought down to the bottom of the hoppers and thus add very materially to the strength of the car by the greater depth of girder that is thus obtained. The tendency of the development that has thus been outlined is away from pressed steel shapes to those that are rolled or built up. This does not mean that pressed shapes have or ever will be entirely discarded, but that the convenience and accuracy attending the working of rolled shapes probably outweighs the advantages accruing from the better theoretical disposition of the metal in pressed steel that will make for less weight in the finished car.

As for accuracy of finish, there is a standing note on the drawings to the effect that the pressed steel parts are subject to variations that in no way affect the efficiency of the car as a whole. Such a note as this would not be applicable to the rolled steel car. On the other hand, the claims that a car may be made lighter with pressed than with rolled steel is not of serious value, as the light weights of the cars of different constructions do not vary very much from each other, the variation being but a few hundred pounds.


Forty-Ton Wooden Coal Car.

The cars, then, that may be taken as typical of those engaged in the seaboard coal trade of the Chesapeake & Ohio are of the hopper bottom type of pressed and rolled steel construction, with some in which the side sills are built up of plates and angles with a tendency in construction to a more extended use of rolled shapes. These cars have been designed by the builders to meet the traffic requirements of the road, and were originally equipped with trucks from the same hands. It was found later that some changes in these trucks

would be needed in order to adopt them to the very severe service to which they would be subjected. Trouble was experienced at first with the heavy cars, in the breakage of the spring seats and carriers, and the arch bars. The location of the springs well inside the arch bars resulted in a great amount of swaying in these large cars with their high centers of gravity. This occurred to such an extent that the side bearings were literally hammered down as though they had been beaten with a sledge. The center plates were not worn or cut away, but the rolling of the car back and forth and striking on the side bearings would increase the clearance of the latter in a comparatively short time from ⅜ in. to an inch or more. To prevent this, the spring seats were moved out and placed directly over the arch bars and made so that the springs would have a bearing at the outer end of a cast steel bolster. This did away with the trouble of the rolling car, but required a reconstruction of the truck framing.

In working out the details of what is now the standard truck, the live load was calculated to be twice the static load, and the maximum fiber stress of the material was placed at 13,000 lbs. per sq. in. under these conditions. This is working with a liberal factor of safety in both directions, for it is not probable that ordinary working conditions on a fairly smooth track will double the effect of the static load, though an increase of 50 per cent. is quite within the limit of what is to be expected. Then the metal ought to be able to sustain any number of repetitions of a stress of 13,000 lbs. per sq. in., which is so far within the limits of elasticity that no injury should result. By so designing the lower spring seat that it can sustain the whole load, with the probable increase, without cracking, a truck has been secured that is giving no trouble from breakages, with a 5-ft. 6-in. wheel base. This involved the use of heavy arch bars, which have been made 1¼ in. and 1½ in. thick for the top and bottom bars respectively, with a common width of 5 in. The tie bar is made ¾ in. thick.

To prevent broken boxes, the opening at the back has been enlarged and this in advance of similar action on the part of the M. C. B. Association, with the standard box. The extension of the wheel base to 5 ft. 6 in. gave more room for the inside hung brakes, and with these there is a peculiar arrangement. The brakes are hung from the inside and the hanger stands at so sharp an angle that trouble might be anticipated with the shoe sticking and jamming when it was somewhat worn. But in reality no such difficulty as this occurs. It will also be noticed that the brakes are hung from the column casting. There is a hole and bars cast in it, through which a 1¼-in. rod is passed from side to side, and it is on this that the shoes are hung. The brake-beams are of channel section of pressed steel so balanced that they can be held horizontally by the levers and with no trouble of tilted and dragging shoes.

Hopper Bottom Coal Car.

It will be seen that these cars have been designed merely as vehicles of transportation, not having to meet any special terminal or loading arrangements. Some of them are higher than those used elsewhere, because the tipples at the mines are so constructed that they can receive them, while at the terminal at Newport News the cars are simply pushed up on a trestle and dumped and then allowed to drift back to the ground by gravity. The cars have been developed with the traffic, and those of lower capacity are being destroyed and replaced, when replacements are necessary, with cars of 100,000 lbs. capacity like those illustrated. This does not hold, however, for the local and western trade, where it is frequently necessary to make smaller carload shipments than 100,000 lbs. and loads of 30 or 40 tons must be delivered. For this work, drop bottom flats are used, but these are for a distinctly different traffic and only enter incidentally into the tidewater trade for which the high capacity cars are used. The road, then, has availed itself of the facilities offered by the steel cars that have been placed on the market by builders, and has made such adaptations as have been needed to meet its own special requirements. It has not been found necessary to design a special car to satisfy the demands of the traffic of the road.


Hopper Bottom Coal Car; Chesapeake & Ohio.

## Detroit River Tunnel.

Sinking the third section of the Detroit River Tunnel has just been completed, making three sections in all in place, a total length of nearly 800 ft. of double track. Everything went according to program with entire success. The quality of the concrete deposited under water is in many respects better than the average concrete placed in open air.

### Car Surpluses and Shortages.

Statistical Bulletin No. 23 A, giving a summary of freight car surpluses and shortages by groups from October 30, 1907, to May 27, 1908, has been issued by the Committee on Car Efficiency, under date of June 5. The grand total of surpluses was 381,904 and of shortages 125, as compared with surpluses of 404,534 and shortages of 159 on May 13.

In transmitting the report Arthur Hale, chairman, says:

"The report for May 27, 1908, shows a decrease of 22,630 cars, of which 20,346 are in coal and gondolas and the balance in flats. Box and miscellaneous cars are about stationary in the grand total figures.

"Reports from a number of the principal roads indicate that from 40 per cent. to 50 per cent. of the decrease in surplus cars is due to an increase in the number of shop cars. It will be remembered that the cars reported as surplus are in addition to the shop cars, which are reported monthly in our Bulletins of Car Balance and Performance.

"Taken by groups, the improvement seems quite general throughout the Eastern, Central and Southern sections of the country. There is practically no change indicated in the Southwestern and Pacific States, Groups 9 and 10. The decrease in coal cars is quite marked in Groups 2 (Central), and 3 (Middle), and the demand for box cars seems to have increased in Groups 6 (Northwestern), 7 (Montana, etc.), and 8 (Middle Western)." The summary for 160 roads is shown in the double column table.

SURPLUSES AND SHORTAGES BI-WEEKLY, FROM OCTOBER 30, 1907, TO MAY 27, 1908, INCLUSIVE.

| Date. | Number of roads. | Surpluses. Box. | Flat. | Coal, gondola and hopper. | Other kinds. | Total. | Shortages Box. | Flat. | Coal, gondola and hopper. | Other kinds. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| May 27, 1908 | 160 | 144,697 | 20,075 | 162,695 | 54,437 | 381,904 | 82 | 13 | 12 | 18 | 125 |
| May 13, 1908 | 163 | 143,822 | 22,949 | 183,041 | 54,722 | 404,534 | 100 | 33 | 16 | 10 | 159 |
| April 29, 1908 | 159 | 147,971 | 24,350 | 186,742 | 54,542 | 413,605 | 145 | 42 | 16 | 64 | 267 |
| April 15, 1908 | 153 | 138,065 | 23,811 | 160,205 | 53,689 | 375,770 | 83 | 7 | 1 | 55 | 146 |
| April 1, 1908 | 158 | 111,748 | 24,774 | 120,669 | 50,316 | 307,507 | 319 | 117 | 8 | 84 | 528 |
| March 18, 1908 | 160 | 103,509 | 25,122 | 119,205 | 49,206 | 297,042 | 533 | 151 | 250 | 73 | 1,007 |
| February 19, 1908 | 161 | 113,776 | 30,088 | 134,217 | 44,432 | 322,513 | 697 | 141 | 249 | 162 | 1,249 |
| January 22, 1908 | 161 | 124,622 | 27,328 | 142,338 | 48,292 | 342,580 | 392 | 132 | 79 | 135 | 738 |
| December 24, 1907 | 158 | 87,714 | 14,740 | 64,556 | 42,300 | 209,310 | 187 | 81 | 191 | 265 | 724 |
| November 27, 1907 | 160 | 16,246 | 3,645 | 10,028 | 10,429 | 40,348 | 11,908 | 868 | 2,964 | 2,224 | 17,964 |
| October 30, 1907 | 161 | 786 | 600 | 1,285 | 1,275 | 3,946 | 61,592 | 3,546 | 15,987 | 9,632 | 90,757 |

### Repairing Steel Cars.

At the February meeting of the Pittsburgh Railway Club, G. E. Carson, M.C.B. of the Pittsburgh & Lake Erie, presented a paper on steel car maintenance, in which he reiterated the statement that the machinery required for this work was exceedingly simple, and that steel car repairing called for no more skill than wooden car repairing. Attention was also called to a rather neglected point that designers can well bear in mind: that as repairs will have to be made at some time, it is well to make some provision for their execution in the design. For example:

Corner posts on large hopper cars should be in two sections so that it would be unnecessary to remove the entire stake in order to make repairs to the lower portion, which is damaged oftener than the top portion.

Few, if any, of the heavy capacity cars have a place of sufficient strength under which jacks can be placed to raise a loaded car without damage to the car or endangering the lives of the workmen.

All 100,000-lb. cars should have four suitable places for jacking on each end of car close to the body bolsters. The construction of the less capacity cars are better in this respect.

All center sills should be spliced in front of the body bolsters, as we all know that portion of the sills between the body bolsters and end sills is most subject to damage, and if spliced the damaged sections can be removed and repaired at less cost than where it is a continuous member.

Train lines should never be hung between the center sills, as they are inaccessible, either for making repairs or discovering leaky connections, and are therefore neglected by the ordinary inspector. When possible, it is preferable to have the train line and all parts of the air brake close to the outside of car, where leaks can be easily discovered and repairs made quickly.

All cars should be so built that it would be possible to apply a train chain to each body bolster in order to haul a defective car to the shop. There are thousands of cars now in service to which chains cannot be applied.

Drop doors on heavy capacity cars should be made with as little mechanism as possible, and at the same time the weight should be such that a man of ordinary strength can close them, as the operating of the doors is always in the hands of the inexperienced, who often are unable physically to close some of the doors without assistance.

The floor sheets on all the cars examined are of the same thickness as the side sheets. If there is any reason for this I have not discovered it. It is recommended that the floor sheets be heavier than the side sheets, especially on gondola cars, for it is observed that the floor sheets wear and rust out long before the side sheets, and when it becomes necessary to renew the floor sheets they must be separated from the side sheets which also show signs of deterioration, especially where they join. In making repairs we cannot help but distort the rivet holes and often tear the side plates. I believe if the floor sheets were heavier the possibility of both sheets wearing out together is greater and the renewal of same would insure better results in workmanship and service.

It is also noticeable on all gondola cars that the floor sheets sag, forming pockets between the center sills, or, in fact, at any point where there is no support underneath. This, of course, is due to the deterioration of the plates or the kind of service the cars are in. During wet weather these pockets are filled with water for days at a time on account of insufficient perforation in floor sheets, which is very injurious, the only escape for the water being through evaporation.

When repairs are to be made it is strongly recommended that they be made under cover, as in zero weather it is impossible to heat and straighten repair parts and drive rivets outside. In the matter of painting, the author follows the old-time suggestion upon which all engineers are agreed, but which so few follow: that the metal should be cleaned by the sand blast before the paint is applied. Failing in the sand blast, the use of steel scratch brushes, sandstone or any tool that will answer, is put in as an alternative, though not as satisfactory a method, and the author says that repainting should be done about once in three years.

As for the costs of repairs, facts were taken from the results obtained on the Pittsburgh & Lake Erie. These cars required heavy repairs, due to wrecks, and the cost was as follows:

| | | | |
|---|---|---|---|
| 100 wooden cars requiring heavy repairs: | | | |
| Cost of material | $2,521.00 | Average per car | $25.21 |
| Labor and supervision | 1,631.00 | " " " | 16.31 |
| Total | $4,152.00 | Total | $41.52 |
| 100 steel cars requiring heavy repairs: | | | |
| Cost of material | $3,424.00 | Average per car | $34.24 |
| Labor and supervision | 2,292.00 | " " " | 22.92 |
| Total | $5,716.00 | Total | $57.16 |

A very accurate record was also kept of the average number of times the different classes of cars were called to the shop for light, medium and heavy repairs, covering a period of one year. This taking of the three classes of repairs together and averaging the costs has the effect, of course, of lowering the average cost per car, far below that given for heavy repairs.

The records referred to are as follows:

| | |
|---|---|
| Average number of times one wooden coal car was in shop during one year | 7 |
| Average cost of repairs each time in shop | $16.23 |
| Average number of times one wooden coke car was in shop during one year | 6 |
| Average cost of repairs each time in shop | $10.74 |

| | |
|---|---|
| Average number of times one steel car was in shop during one year | 1⅛ |
| Average cost of repairs each time in shop | $6.74 |

The above figures represent the cost of material and labor less scrap credits, and is the average cost of the total repairs to

| | |
|---|---|
| 806 | heavy steel car repairs, |
| 1,352 | medium steel car repairs, |
| 9,180 | light steel car repairs, |
| 11,338 | |
| 707 | heavy wood coal car repairs, |
| 513 | heavy wood coke car repairs, |
| 3,018 | medium wood coal car repairs, |
| 3,354 | medium wood coke car repairs, |
| 12,438 | light wood coal car repairs, |
| 12,040 | light wood coke car repairs, |
| 32,070 | |

Attention is called particularly to the number of times a steel and a wood car is called into the shop per year, and to the difference in the cost of maintenance per car. Of course, it must be understood that when the time comes to renew the steel car parts which are worn out, the figures shown will be inadequate for the reason that we are comparing steel cars with a collection of new and old wood cars, but even so, if we give the steel cars the proper care their maintenance will be less in the end than that of wood cars.

As it stands, however, it appears that when cars are seriously injured in a wreck the cost of repairing the steel car is higher than it is in the case of a wooden one.

## Standard Freight Car; Virginian Railway.

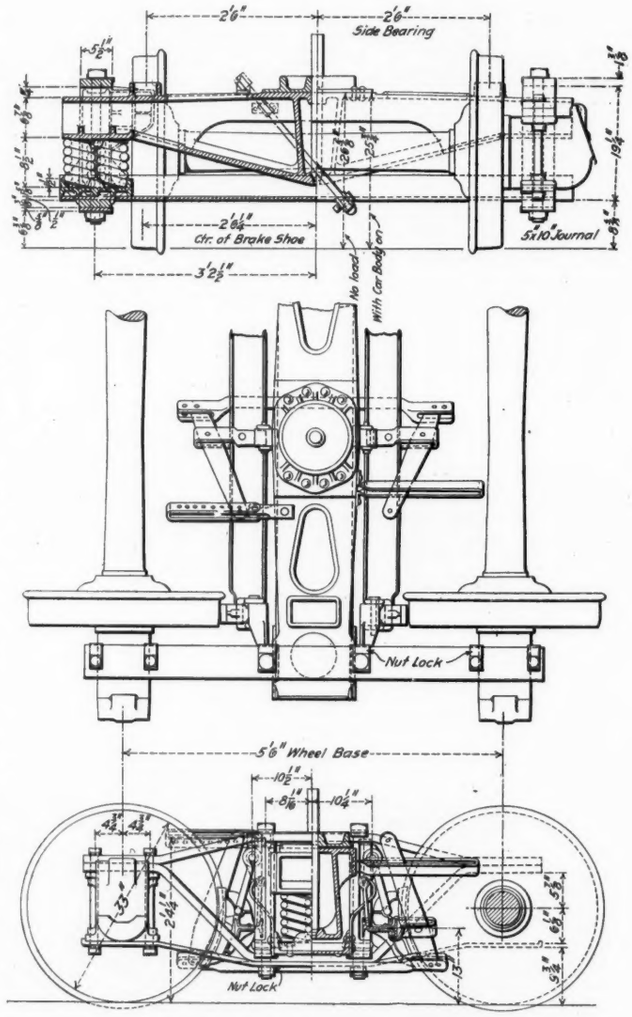
There have been published in the *Railroad Gazette* in the issues of March 15, 1907; August 23, 1907, and March 13, 1908, articles regarding the engineering features of the Tidewater and the Deepwater Railways, now known as the Virginian Railway, in which the high character of all of the work pertaining to permanent way and structures has been set forth. The fundamental idea of the location and construction is that of so building the road that heavy traffic can be moved from the mines in the mountains of West Virginia to the sea at minimum cost. In the roadway, the means to that end is the use of a maximum grade of 0.2 per cent., compensated for curves, against eastbound traffic. This maximum rules for the whole distance from the assembling yards at Princeton to Sewall's Point, with the exception of a pusher grade up the western slope of the Allegheny mountains. All bridges and trestles have been built to carry cars of 100,000 lbs. capacity hauled by locomotives which can pull about 6,000 gross tons back of the tender.

Until about eight months ago, the energies of the promoters and engineers were devoted exclusively to the permanent way. At that time, it became necessary to turn attention to the rolling stock. The problem was not to be solved by merely taking a locomotive capable of exerting the necessary tractive power and the usual type of cars of the required capacity. There were requirements of traffic and of handling which the ordinary car is not designed to meet. At the mines and on the road the service of the cars will not differ from that common elsewhere, but at the terminal it was desired to have a car that would not be injured by the hard work of unloading. This is to be done by a Hewlett unloading machine, in which the car is lifted bodily from the rails and turned over so that its contents are dumped into a receiving car at one side. It is in such treatment as this that the cars are injured. The car is first moved to one side until its sides come to a bearing against the machine; then heavy arms come down, reaching across the top to hold it in place, and it is turned upside down. With a load of from 100,000 to 110,000 lbs. in the car, the springs are compressed an inch or more, and when the car is emptied, these springs force the body upward with a tension equal to the original load; all this must be sustained by the sides. In other words, with the load removed there is a pressure of 110,000 lbs. distributed over eight points, four on each side, or 13,750 lbs. at each point of contact of the holding-down bars. The ordinary result of this loading is that the top edges of the sides are crumpled and bent and the cost of repairs is high. This is because the car was not designed to withstand such strains, either because it was designed before the unloading machine came into service or because the matter of this top bearing stress was overlooked.

Again, the road service of the Virginian Railway cars is to be exceptionally severe. The rated train load will be 80 loaded cars of 100,000 lbs. capacity, with a 10 per cent. overload, a total, as has been said, of about 6,000 tons back of the tender in addition to the caboose. That the buffing and pulling stresses under such conditions will be very high goes without saying, and it was necessary to provide for a maximum and at the same time put as little strain on the car framing as possible.

The aim, then, in designing a car for this traffic was to make one that can be turned upside down and held by the Hewlett clamps at the top of the sides without injury and also have a longitudinal strength sufficient to sustain the hauling and buffing stresses of road work.

As the cars are to be built for home traffic, where unloading will be done by the Hewlett machine, it was unnecessary




Standard 50-Ton Freight Truck; Virginian Railway.

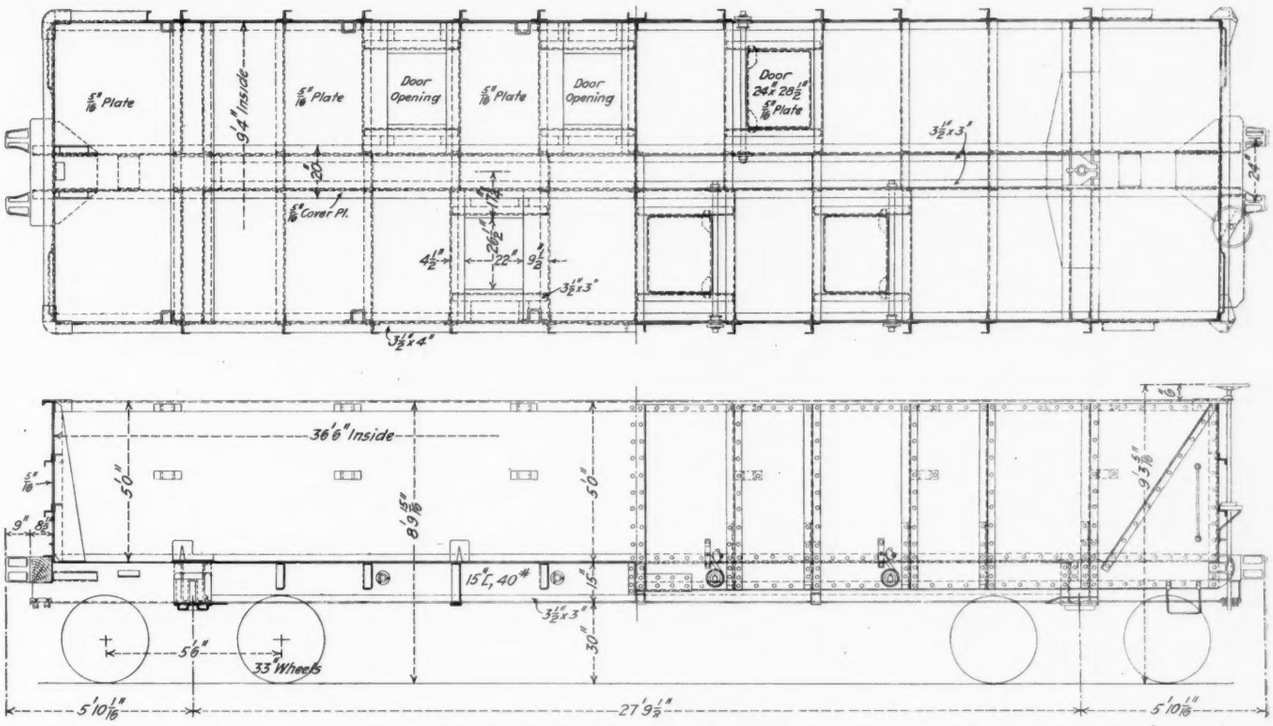
to provide hoppers or a bottom means of emptying. The floors are, therefore, to be flat; but in order that the car may be used on the lines west of Deepwater, and over ordinary coal pockets, drop doors are located beneath the floors.

The main features of the car that has been designed, when regarded from the point of view of construction, are that the sides have been so proportioned that they can sustain the whole load, and the center sills have been considered merely as a column to take care of buffing and hauling stresses. The manner in which this combination of requirements has been met involves a number of novelties in the details of construction that are worth careful examination.

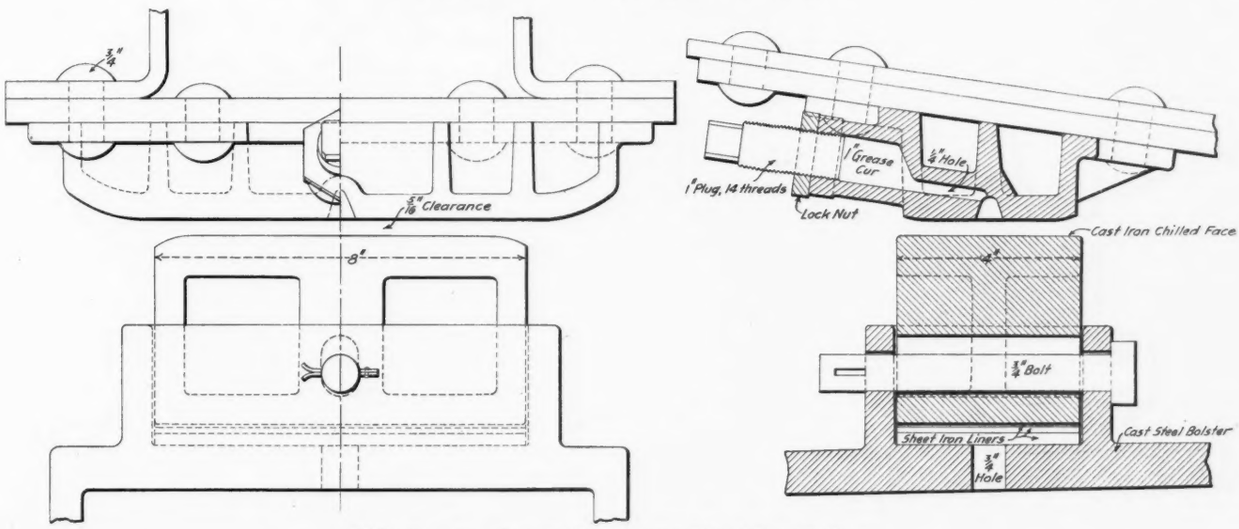
Starting with the main framing, the center sills are the principal elements. They are of 15-in. channels weighing 40 lbs. to the foot; these are 37 ft. 11 in. long and extend the full length of the car. As for the side sills, there are

really none at all. The side plate is carried down to the lower edge of the pressed steel diaphragm that forms the body bolster and is stiffened along its lower edge by a 3½-in. by 3-in. angle that runs the whole length of the car.

The designer has taken advantage of the clear field before him to standardize the several parts of the car, and it is intended to use the same details for all cars, whether coal, coke, box or caboose, as well as for engine tenders, with merely the necessary changes in lengths for individual cases. So in




100,000-lb. Gondola; Virginian Railway.




Side Bearing for Freight Cars; Virginian Railway.

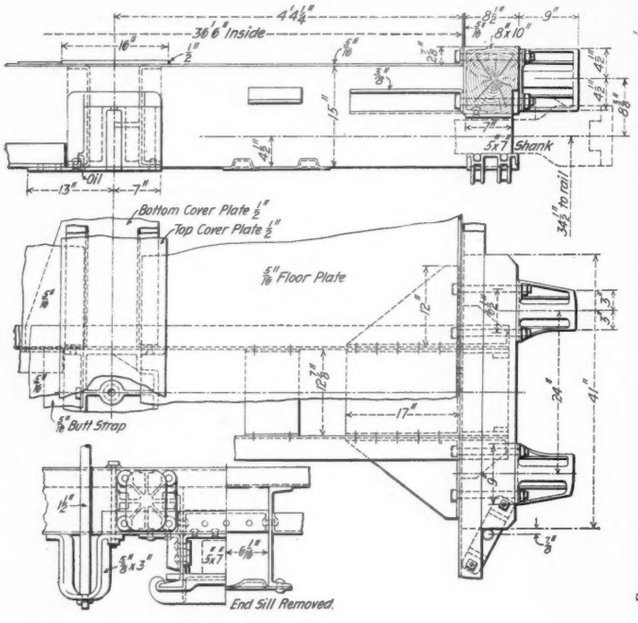
the design of the body bolster the diaphragm that is used as a filler between the center sills and the side will be used without change for all car and tender frames not only at the bolsters but for the main intermediate cross-ties. This diaphragm is of ⅜-in. steel and has a flange 3¼ in. deep, including the thickness of the plate turned around the whole edge. There are two of these diaphragms, turned back to back on each side, and they are riveted to the center sill, four of the rivets passing through and holding the center casting. At the outer end the riveting is through the flange of the diaphragm, the side plate and the flange of the Z bar stake. All rivets are ¾ in. diameter driven in 13/16-in. punched holes. This is the size of all the rivets of the car, except those holding the draft rigging; these are ⅞ in. in diameter driven in reamed holes. There are two cover plates, 5/16 in. and ½ in. thick, respectively, for the bolster, the thinner one being next the diaphragm and turned up at the ends to bear against the side plate. There is also a ½-in. plate on the bottom that widens to 2 ft. 8 in. where it has its bearing on the sills. Between the channels there is a steel center casting with a cavity for the center pin and a hole over the top for driving the pin out in case it should become stuck.

At the sides the usual form of pressed steel stakes has been discarded and Z bars put in instead. There are several reasons for this. In the first place, the pressed steel stakes are too weak to carry the loads properly. It was found that when a Z bar 4 in. deep was put on one side of a car, a pressed steel stake on the other side and a jack bearing against the two was put in between, the pressed steel stake could be pushed out well over to one side while the Z bar remained vertical and undisturbed. Not only was a stronger

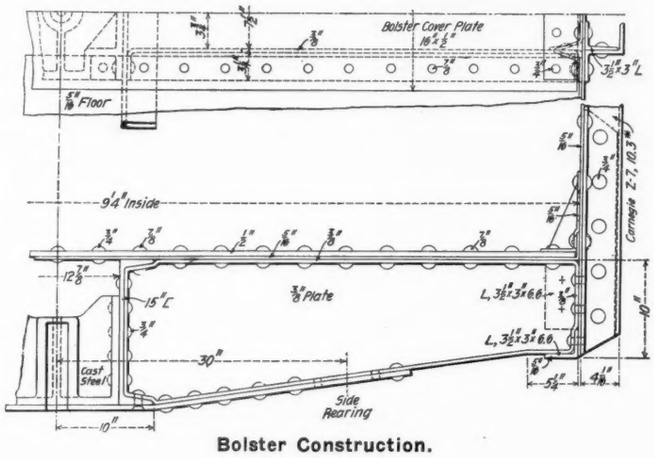
construction needed to hold the sides in against the pressure of the lading, but the stakes had to be sufficiently strong to carry the car on its side in the unloading machine. The 4-in. Z bar also has the advantage of projecting far enough beyond the side sheets to make it possible to keep all hand holds and grab irons inside the extreme outer edges. At the bottom the Z bars are stiffened by 3-in. by 3½-in. angles weighing 6.6 lbs. to the foot. These run from the bottom of the side plate up to a point 14¼ in. above the top of the diaphragm. The Z bars are further stiffened by a pressed steel brace set inside the side sheets.

These side sheets are $\frac{5}{16}$ in. thick and their overall width is 5 ft. 10 in., of which 10 in. is below the top of the diaphragm, leaving a clear depth of 5 ft. The other inside dimensions of the car are 9 ft. 4 in. and 36 ft. 6 in. At the top there is a special angle. It is not a bulb angle, but has, instead of the bulb, a leg that thickens in a straight line from the angle to the outside, so that it fits down on the bevel to which the ends of the Z stakes are cut. On the inside, next the stakes, there are pockets with a rectangular opening to take the stakes required when the car is to be used to carry lumber.

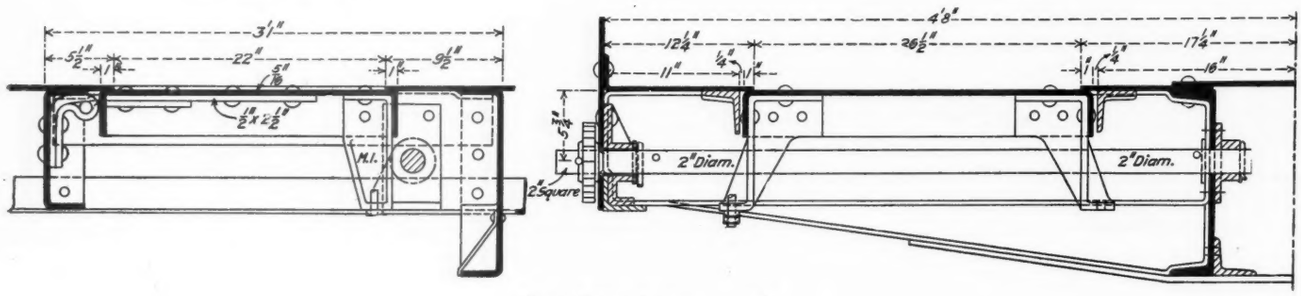
At the corners, an angle is used for a post; this is capped by a steel casting that projects at the side 4 in. beyond the plates so that it is in line with the Z bars, and thus forms another resting place for the side of the car when in the un-



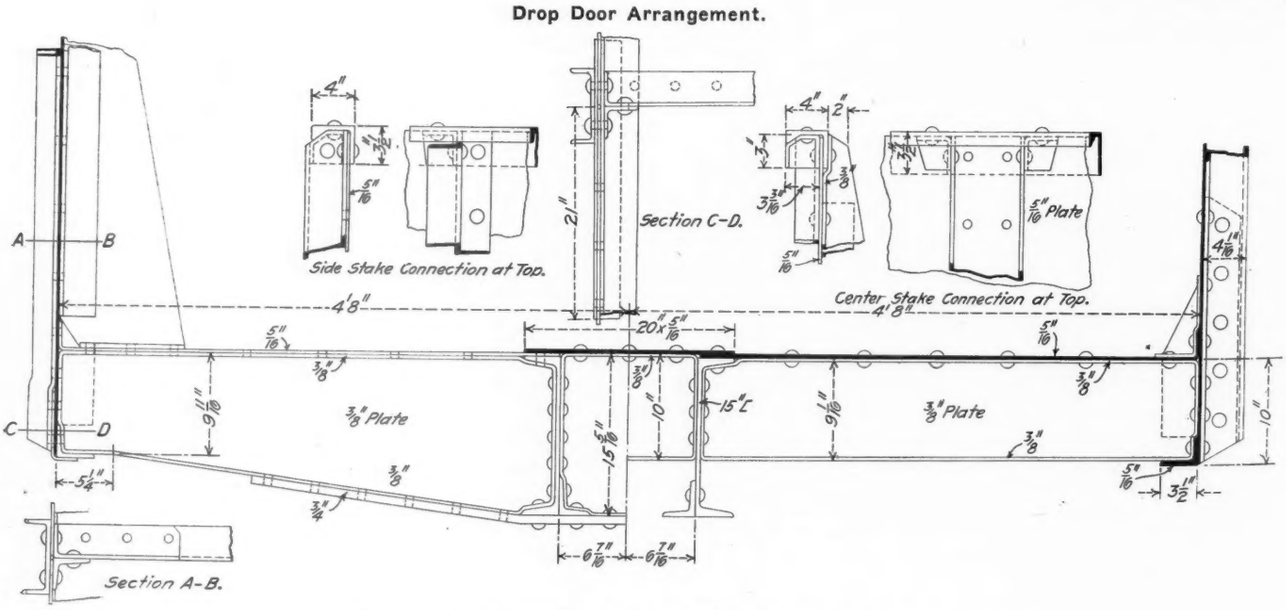

End Construction.




Bolster Construction.




Drop Door Arrangement.

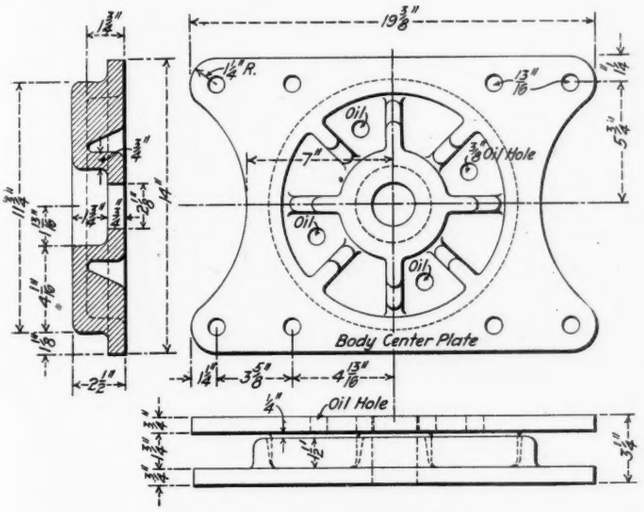



Deep and Shallow Diaphragms; Virginian Railway.

loading machine. The clamps of this machine will be so adjusted that they will come to a bearing immediately over the stakes so that the pressure exerted when the car is emptied will come directly on the end of a column whose metal is disposed in the best way to withstand it.

The sides are built of two sheets, having a joint at the center. This joint is covered by a 6-in. channel and is stiffened on the inside by a pressed steel gusset and angle. The gusset is ⅜ in. thick and extends 2 ft. back into the car. The car being 36 ft. 6 in. long, this will not interfere with the loading of any lumber less than 20 ft. long. At the top there is an angle plate set on over the outside of the side sheet, lipping down beneath the bottom angle and extending for 12 in. on each side of the center.

At the center there is a pressed steel diaphragm identical with that used for the bolster. There is also another between it and the bolster, so that in all there are seven of these on each side. In addition to these there are three other intermediates on each side of the center. They are rectangular in contour, except that they are bent away to conform to the outline of the bottom side angle and the upper flange of the center sill. They form a part of the cross-bracing of the frame. At the ends the plates are stiffened by horizontal Z bars, and to these projections are attached the brackets for fastening the brake staff. The overhang is also braced by a 3-in. by 3½-in. angle riveted diagonally to the side sheet




Center Plate for Freight Cars.

from the bolster to the upper corner, though the main reason for its use is to stiffen the side sheet against bulging.

In the floor there will be four doors for bottom dumping. These doors are in alternate panels on either side of the center and are staggered. Their faces come flush with the main floor. They are held in position by hinges and a chain that is wound on a spindle. To protect these working parts from the dumping load, they are set in the pockets formed by the flanges of the diaphragms, which are placed facing each other in the panels occupied by the doors. The flanges do not cover all the rigging but form a convenient recess in which to place it. The door itself is of pressed steel and has a strong steel casting riveted to the lower side to which the chain is attached. The winding shaft runs from the outside to and through the center sill and its ratchet is outside. The extreme projection, however, is within the outer line of the Z stakes, so that the end will not come in contact with the sides of the unloading machine when the car is being dumped. The chains are fastened to the shaft near the ends, just inside the bearings so that they tend to wind in a helix and not climb.

Carefully as these details have been considered and worked out, there is probably no detail of the car that has received the attention that has been given to the draft rigging. It is, of course, apparent that this must be of the most substantial character if trains of the proposed weight of 6,000 tons are to be operated successfully. And the whole columnar construction must be able to withstand the battering ram punishment that goes with such service.

In discussing this part of the subject, it will be necessary to take the construction of the whole front end of the car into consideration. The end sill is a 10-in. channel that rises 2½ in. above the floor, which is flanged up and riveted to it. A shoulder is thus formed across the end which makes such a riveting possible and also serves as a bearing for the bolts holding the buffer blocks in position. The distance from the bottom of the end sill to the bottom of the center sill is thus 7½ in. Beneath the end sill there is a U-shaped stiffening block, A, which spans the coupler opening, stiffens the end sill and serves as a shelf to carry the oak filler back of the buffer blocks. A pressed steel gusset brace is also riveted back of the end sill and to both center sills; these latter are tied together at the bottom by a clamp that lips over both flanges and is held by a pin with a split key which is easily reached and removed. The side play allowed the coupler head is 1¾ in. on each side. The follower stop casting is riveted to the outside of the center sills with twenty ⅞-in. rivets driven in reamed holes. This would, if the ordinary dimensions were used, leave an opening of about 1¾ in. between the center sills and the shank on each side, and in crossing this the keys would be subjected to a bending stress. To avoid this and put these keys under shear only, the back end of the coupler shank has been widened to fill the whole space, and, as it can be put in place from the bottom, this change can cause no trouble. It has not yet been decided just what type of draft gear will be used, but it will probably be a friction one. The arrangement is such that in case the buffing stresses are so great as to drive the drawbar home by the compression of the oak filling back of the buffer block, the coupler will come to a bearing at the back against the bolster.

Incidental to the draft gear and because of the use of the car in an unloading machine, a plate, B, has been put in above the coupler shank and extending across between the side sills, to prevent the tail pin from dropping out when the car is turned upside down.

The use of the buffer block is not new, but the special arrangement used here is a novelty. In the first place, it has been the practice both in the United States and in Europe to use buffer blocks with a convex bearing or abutting surface. As a matter of fact, with the rigid blocks, only the outer halves of the sides on the inside of the curve can come into contact when the train turns. Hence the rounding of the inside half of the block is unnecessary. In this case it has, therefore, been left flat, so that a larger area of contact with less wear has been obtained. These buffers are bolted to oak backings, which, in turn, bear against the channel end sill. The dimensions are such that these buffers will come together before the horn of the coupler can strike.

Experiments that have recently been made go to prove that a block of oak 8 in. thick can be compressed more than an inch by a blow, and that when relieved it will recover to its original dimensions. It is interesting to note also that the diagram of these compressive strains and recovery correspond to what would be considered an ideal performance for a friction draft gear, and that the efficiency is very high. Based on these experiments, the inference is that if a solid block of oak 8 in. thick can be compressed and recover an inch, the yield and possible recovery of a wooden car must be very much greater. As to how much greater, we have no data. But at any rate it would appear that a steel car is in much greater need of an elastic buffer than the wooden one and so such a block as this will be of great value as a protection. This matter of the cushioning property of the oak block will be taken up in a later issue.

Turning now to the connection between the body and the truck, it has been the theoretical opinion for many years that some means of lubrication should be used, but few have made a practical application of these theories. In this car provision has been made for lubricating not only the center plates but the side bearings as well. The center casting of the bolster is of steel and the bottom reinforcing plate is beneath it, as already noted. The center plate of cast steel is riveted beneath that. This is made with the ring projection hollow and directly above the opening there is an oil hole in the center casting. This is readily accessible, so that

oil can be poured in to fill or partially fill the annular space in the center plate. Small oil holes in the bottom of this carry the oil down to the bearing surface. In making the ring it is stiffened by brackets projecting alternately from the inner and the outer walls. This is to avoid shrinkage stresses in the casting.

While it is desirable to lubricate the center plates, it is still more desirable that a similar provision be made for the side bearings, and this very unusual thing has been done in this instance. A hollow side bearing is riveted to the bottom face of the bolster, and on the outside face there is a cavity fitted with a screw plug having a check nut by which grease can be forced in on the bearing just as with any pressure grease lubricator. The reason for using grease in this place is because oil would run out when the car is turned upside down in the unloading machine. It cannot escape from the center plate because the oil hole will not be at the lowest point. The side bearing on the truck is of cast iron with a chilled face. It is held in place by a cottered bolt and is carried on sheet iron liners used for adjustment, which are put in the bottom of the pocket in which the side bearing proper is placed. With this arrangement, renewals and adjustments will be very easily made and the standard clearance of $\frac{1}{16}$ in. will be maintained.

The truck is of the regular arch bar type, but the arch bars are 5½ in. wide instead of the usual 5-in. The bars are 1⅜ in. thick. The bolster is of cast steel and will weigh about 700 lbs. It is so proportioned that any of the regular types can be used. The center plate, however, instead of being cast integrally with the bolster, is riveted on it. This is to avoid the necessity of discarding a heavy bolster casting in case the center plate should be untrue in its contour. It also insures always a proper surface, adjustment and contour in the center plate itself. The springs are the standard M. C. B. class D for cars of 100,000 lbs. capacity. In the spring seats provision had to be made to prevent any loose springs from dropping out in the overturning of the car.

It will be noticed that the brake rigging is set somewhat higher on these trucks than we ordinarily find it. The reason lies in the fact that the trucks are designed to be hauled up the incline to the unloading machine by a cable, and that this cable has a sharp upward inclination from the bolsters which the brake-beams must clear. The wheel base is 5 ft. 6 in. and the wheels 33 in. in diameter, but even with these dimensions the high location of the brake-beam, whose center is only 3½ in. below the center of the wheel, made it necessary to use compressed ends. The brakes are hung at the ends from the column castings in the usual manner, and then in order to prevent the beam from tipping forward and allowing the shoes to drag at their upper ends against the wheels, there is a hanger carried on a thin piece of brass, shaped like the retracting springs of a passenger truck. This hanger has a bearing on top of the I forming the beam and holds it down. This is a reversal of the usual method of holding the beam up from the front, which could not be done in this case because of the hauling cable mentioned above. In other respects, the truck is built quite in accordance with regular standard practice.

Summing up, this car is to be used in long, practically continuous runs at moderately high speeds, in long trains, heavily loaded with all cars under air-brake control, and then at the end it is to be picked up by an unloading machine, turned bottom side up and hurried back to the mines for another load. The car must, therefore, be able to withstand not only the heavy tractive efforts of locomotives capable of hauling such trains but also the buffing stresses in hump yards where it must strike and receive blows of considerable magnitude in the regular work of switching and classification.

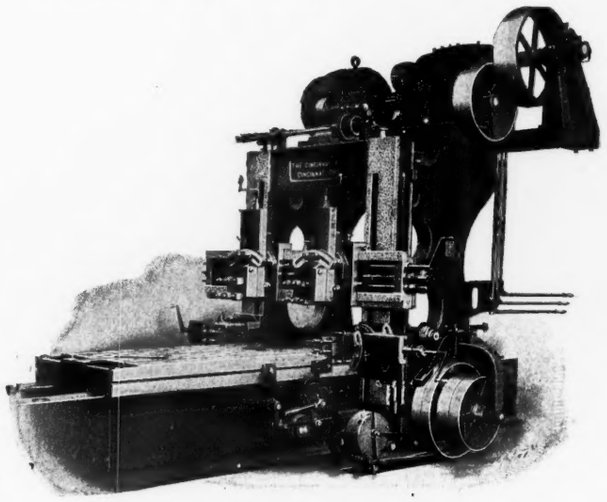
The design is at least unique; discarding the side sills and placing sole dependence on the sides to carry the load while the center sills are used mainly for buffing and pulling stresses, and the design of stakes to support the car and a portion of its load when lying on its side are details whose efficiency in service will be watched with the keenest interest by those who need cars for similar service.

The car was designed by R. P. C. Sanderson, Superintendent of Motive Power of the Virginian Railway, to whom we are indebted for the information regarding its details and construction.

## 37-in. Heavy Forge Planer.

A new 37-in. forge planer, built for heavy work, is shown in the accompanying illustration. The bed is massive and extra long, so that there is very little overhang of the table when planing at full stroke. The bed is bored out to a jig, and the shaft boxes, which are accurately ground, are fitted solidly into the bed, with a bearing at each end. The Vs are fitted with automatic roller oiling devices. The table is quite deep and is thoroughly ribbed underneath by an improved method to insure stiffness. It is fitted with a dirt-proof feature, which prevents chips from falling into the Vs. Holes are drilled and reamed from the solid, and T-slots planed its entire length. There is a complete shifting mechanism on both sides.

The housings are heavy box construction, and are carried down to the bottom of the bed. They are fastened to the bed by heavy bolts and dowel pins, and in addition are secured to it by a long tongue and groove. They are tied together at the top by a heavy box-shaped arch proportioned to give the greatest rigidity and resistance to jar from heavy cuts when tools are at the highest point. The cross rail has a large



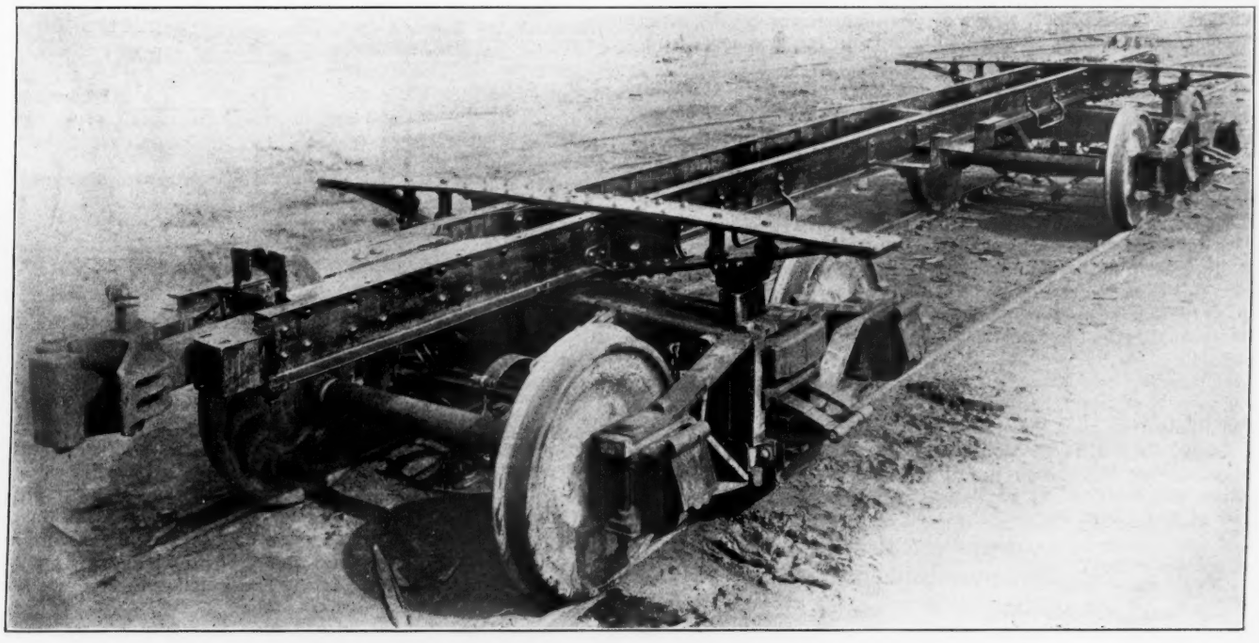
Cincinnati Heavy Forge Planer.

bearing on the housings, and is strengthened by an arch-shaped brace on the back. This rail is long enough to allow an extra head to be attached at any time, either head having full travel across the table. The heads are a new shape, the end of the tool block and slide being made round to clear projecting corners when on angular work. They have taper gibs, and the slides are hung on ball bearings. The heads are made right and left, and have automatic feed in all directions. Side heads can be fitted on one or both housings, with independent power and hand vertical feed, and can be run below the top of the table when not in use. The handles, which control the feeds, travel up and down with the heads, being always convenient to the operator.

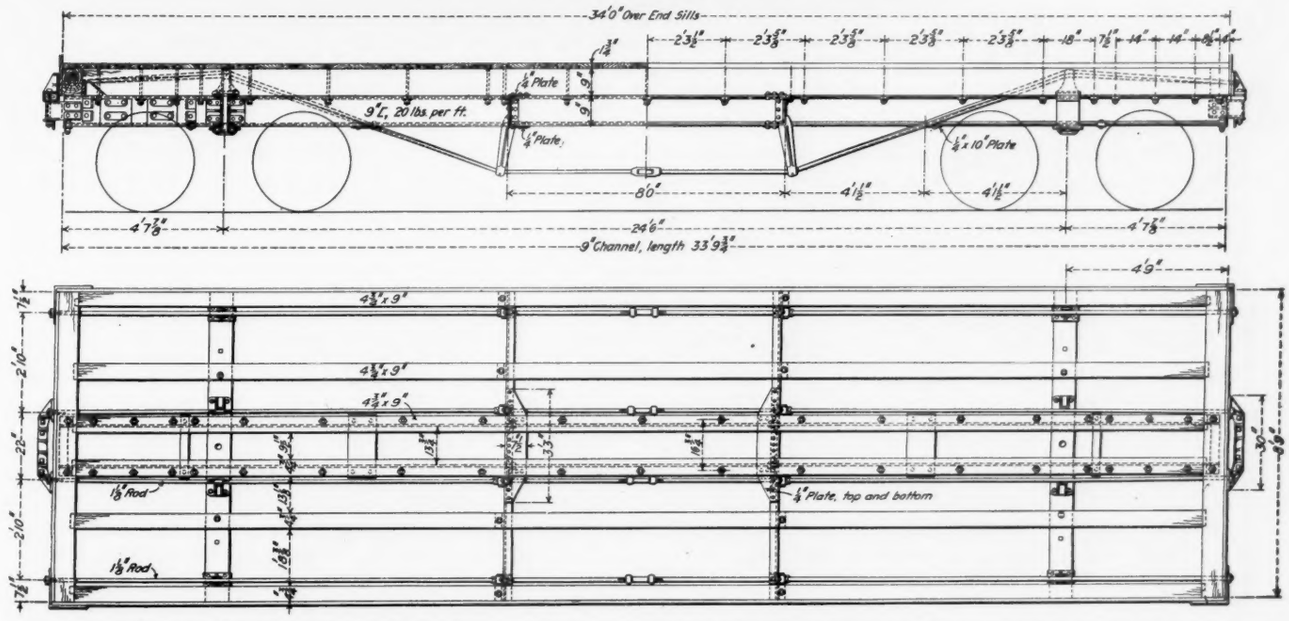
There is a power elevating device on the machine in the center of the arch, providing a third bearing for the elevating shaft and distributing the pull equally. A combination friction insures positive feed when the tools are making their heaviest cuts. The design of the shifter is such that the table reverses without shock or jar, and all disagreeable noise of the belts is prevented. It also has a safety locking device to prevent the table from starting except at the will of the operator. The driving pulleys have an oil reservoir to insure their being oiled without constant attention. The pulley shaft, the only high-speed shaft in the machine, is made ring oiling, and runs in bronze bearings. The driving shafts are made of crucible steel and are accurately ground. The gearing is very powerful, cut from solid stock and all placed on the inside of the bed. The large gears and rack are made from semi-steel castings and the pinions from steel forgings. The planer is built for speeds as high as any that present high-speed steels will permit. The Cincinnati Planer Co., Cincinnati, O., is the builder.

### Reinforcing Light Wooden Cars on the Santa Fe.

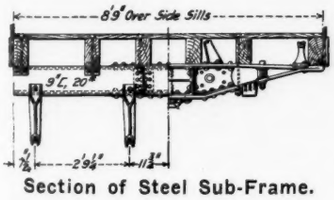
Two years ago the Atchison, Topeka & Santa Fe had a large number of all-wood freight cars of 40,000 lbs. capacity, which were good for some years of use provided they could be strengthened at reasonable cost to stand the severities of present service. The draft gear, with its wooden draft sills, was the weakest point, and some way had to be provided to protect it against the heavy pulling and buffing stresses. There were about 3,000 of these cars, one-third of them being 34-ft. box cars, and the remainder 34-ft. gondolas. The plan adopted was the application of a steel sub-frame, drawings of which are shown herewith.



Santa Fe Steel Sub-Frame as Applied to Cabooses.




Plan and Side Elevation of Steel Sub-Frame Reinforcement for Wooden Cars; Atchison, Topeka & Santa Fe.




Section of Steel Sub-Frame.

No change is made in the wooden underframing. A pair of 9-in. 20-lb. channels are bolted to the under side of the wooden center sills, to which the draft gear is attached, giving continuous draft sills. The draft lug castings, which are malleable iron, have a 5-in. shoulder on the front end which comes back of the end sill, and a narrow oak block is driven between the end sill and shoulder. The inner truss rods pass through cast steel dead blocks on the front of the end sills, tying the structure together rigidly. The original top and bottom body-bolster plates were used, the ends being drawn out to provide the slight increase in length needed for them to pass above and below the steel draft sills. The spacing blocks and center casting are malleable iron. The wooden center sills are dapped over the top bolster plate to allow the steel draft sills to come against the bottoms of the wooden sills. Incidentally, this affords additional strength against longitudinal stresses. The side sills rest on top of the bolsters.

A special feature of the sub-frame is the channel cross-bearers. These are the same section as the draft sills and are made up of three short lengths, as the drawing shows.

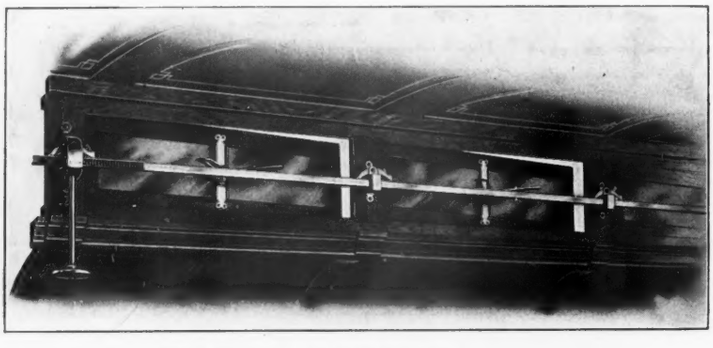
These are secured to the draft sills by short sections of 3-in. x 3-in. x ⅜-in. angles, and the whole made continuous by ¼-in. plates across the joints at the top and bottom, riveted to the different members. These cross-bearers are one of the economical features of the arrangement. Being formed of short pieces, they enable use to be made of those lengths which have been rejected in rolling at the mill as unsuitable for the draft sills because of being under length, or not quite up to specifications in some respect which still does not disqualify them for the use made of them. These pieces can, of course, be bought cheaply; or by the railroad agreeing to take them, the ton price for the steel for the cars can be made lower by the mill. The subframe shown in the photograph is for a caboose and therefore has no cross-bearers.

The original truss rods of the cars were used if in suitable condition. They were lengthened slightly to give a deeper truss, and lessen the stress on the rods. In overloading the cars, if necessary, cast steel or built-up truck bolsters were put in, and the brake rigging was carefully overhauled. The marked capacity of the cars was increased 10,000 lbs., the 40,000-lb. cars being marked up to 50,000 lbs.

As mentioned at the outset, many of these cars have been running from a year and a half to two years, and their condition has been altogether satisfactory. The cost of applying the sub-frame is $150 to $175 a car. Plans are now being made for its application to some 40-ft. 50,000-lb. cars and some 34-ft. 60,000-lb. cars, as well as some tank cars. In addition to strengthening the wooden cars, the frame has been used on 700 new 40-ft. refrigerator cars and 100 new cabooses. It is also likely that it will be used on new box cars up to 70,000 or 80,000 lbs. capacity, as their weight will run 2,000 lbs. or more lighter than with an all-steel underframe. The subframe was designed by E. Posson, Engineer of Car Construction of the Santa Fe.

## A New Car Ventilating Device.

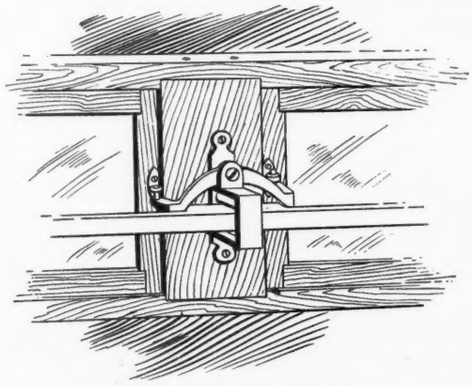
A simple and novel mechanism for the operation of ventilating windows in passenger equipment has been designed by Stephen E. Cibulas, of Bridgeport, Conn. This device has for its object the operation, as a unit, of a series of windows so that each one may be made a source of ventilation regardless of the direction the car is going or so that all may be locked in the closed position.



Cibulas Car Ventilating Device.

In ventilating passenger cars it is desirable to produce a slight current that will carry the impure air from the car and avoid a direct current into the car. With end swinging windows it has been found that by closing the forward end of the window and opening the rear end, the suction caused by the train will remove the air from the car and provide a comfortable means of ventilation. Quite a number of passenger cars, including much of the equipment used in the New York subway, are equipped with window devices that swing at but one end of the window. While efficient when the car is going in one direction, these are objectionable when moving in the other direction, as the windows must be kept closed, or nearly so, to prevent an inrush of dust and cinders. This defect is partially overcome in some instances by the use of operating devices constructed to swing alternating windows from opposite ends, but even this arrangement of mechanism permits the use of but one-half of the full ventilating capacity.

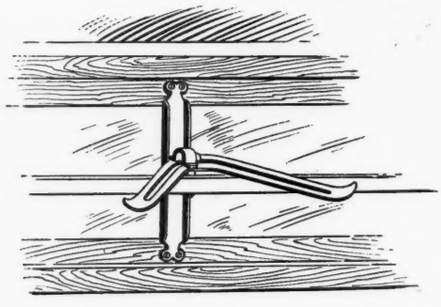
The purpose of the invention of Mr. Cibulas is to allow a ventilation that will be uniform in all parts of the car and one that can be regulated from either end for a constant changing of the air. The device as shown in the accompanying illustrations has for its component parts a shaft or operating bar running the full length of the car and controlled at each end by a hand wheel operating a pinion. On the framework between the windows and at the end of the series from which the windows are actuated are a bracket and rocker arm



Rocker and Operating Bar.

which, when the windows are in a closed position, engage with an eye located at each end of the window frame. Each window at its mid-length is provided with a cross piece to which is rigidly secured an angle slot having a relatively short straight portion between the angle sides. The angle slots are engaged by an operating pin fastened to the operating bar. At proper distances on the bar are cams, the purpose of which is to operate the rocker arms.

When the window is closed, the operating pin is in the center or straight position of the angle slot and the ends of the windows are locked by the hinge pins attached to the rocker arms engaging the eyes at each end of the window.



Angle Slot.

As the bar is pushed from left to right the cam forces the right arm of the rocker upwards, fastening the left end of the window and disengaging the right end. Simultaneously the operating pin travels along the right portion of the angle slot forcing the window open. When the windows have reached their extreme open position, the pins lie at the extreme ends of the angle slots. By reversing the direction of the motion of the bar the operator can change the position of the windows so that the right ends will be closed and the left ends open.

It is intended to make the fittings of this mechanism of brass so that its installation in passenger cars will enhance the appearance of modern equipment.

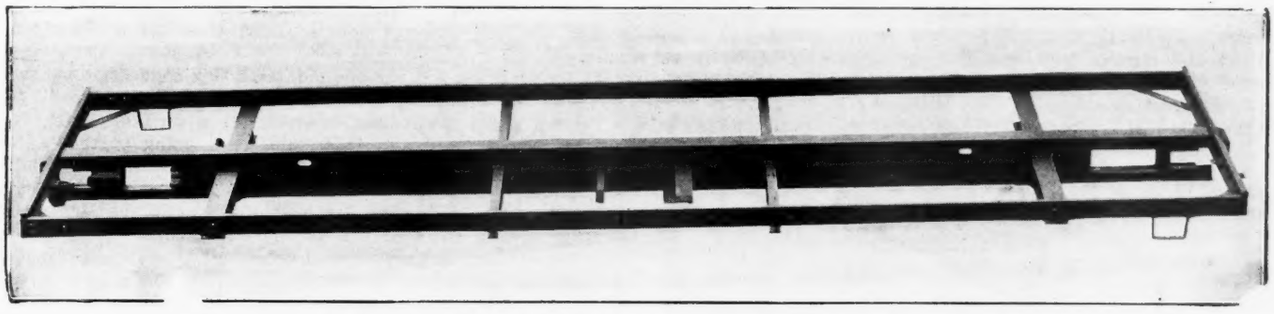
Henry C. Granger, Concessionary for the Uraba Railroad, Colombia, has been given a year in which to present new plans for the proposed line from Uraba or Reyes to Dabeiba, the plans heretofore submitted having been unacceptable to the government.

### 30-Ton Steel Underframe Stock Car.

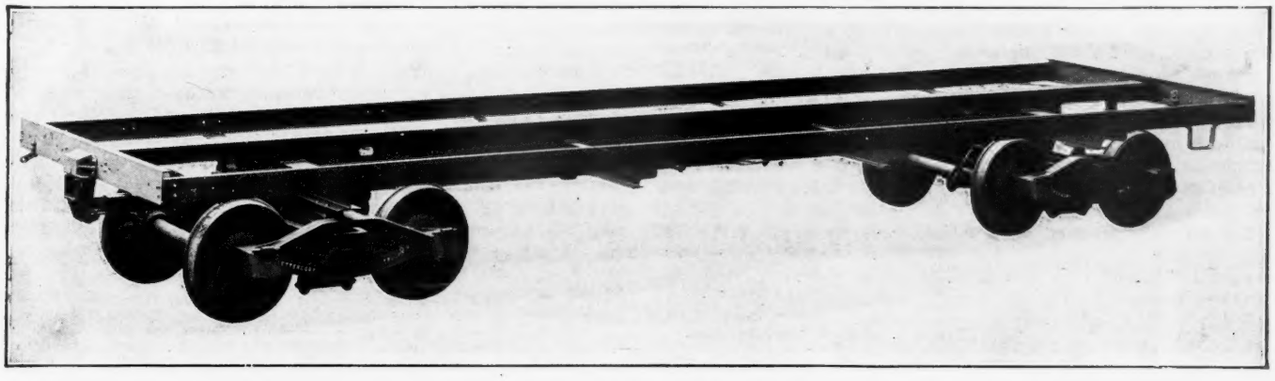
The Chicago, Milwaukee & St. Paul is building at its West Milwaukee shops 2,500 steel underframe stock cars which have some novel features of design in both the underframe and the steel swing-motion trucks. The parts mentioned were designed and are being made by the Bettendorf Axle Company, Davenport, Iowa. The underframes are being delivered to the railroad's shops at the rate of 30 to 35 a day. The primary object in the design of the underframe was to get a cheap construction in steel. It is a single center sill type, made of rolled sections and, it is thought, will have advantages in the way of easy riding.

The center sill is a heavy 18-in. Bethlehem special I-beam extending from end sill to end sill, and connected to the latter by heavy malleable iron striking plates. The side sills are 7-in. channels carried by the needle-beams and body bolsters. The light, flexible structure thus formed is adapted to conform to the irregularities of track in the mountains. The cross-stills or needle-beams are 8-in. I-beams, which extend from side to side of car, passing through the center-sill web and secured thereto by malleable iron connection castings. The sill does not therefore depend upon riveting to support its load; should the connecting rivets be sheared away, the center-sill web would still support the needle-beam. The bolsters also are continuous, passing through the center-sill web and secured in the same way as the needle-beams. They are single girder beams, 8-in. deep, with flanges 8-in. wide. The end sill is a 9-in. channel secured to the center-sill by connection gussets. The striking plate, which is riveted to the end sill, supports a heavy coupler carry iron which is also secured to the end of the center sill.

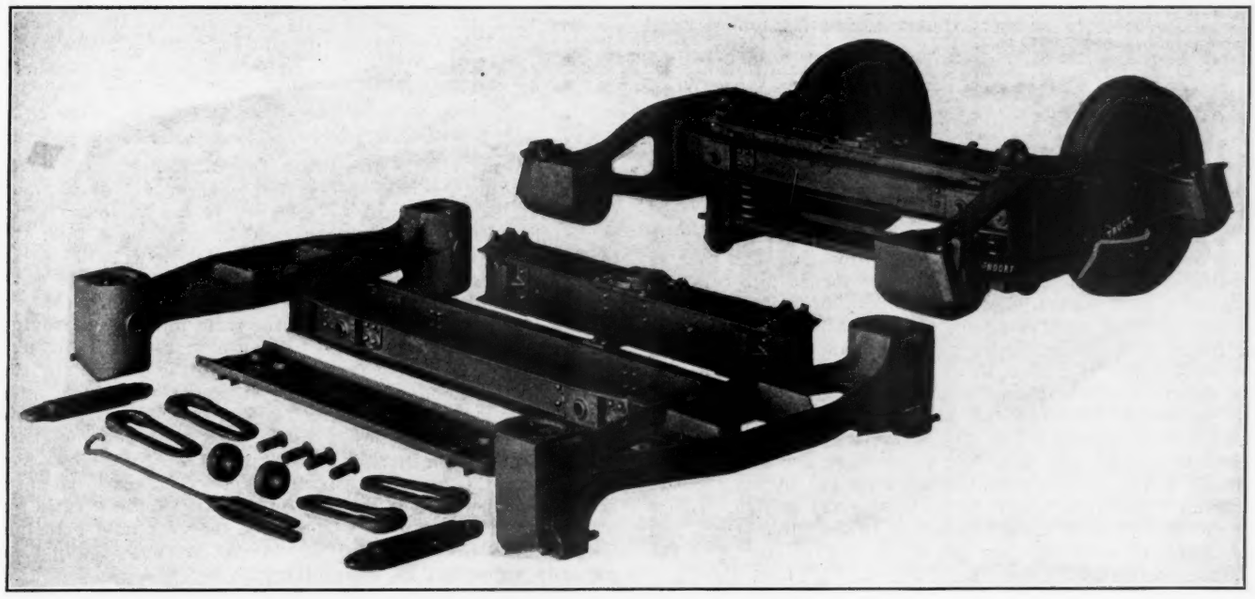
The application of the draft gear is novel, the center-sill web being cut away near the end sill to accommodate the



Underframe of 30-Ton Stock Car; Chicago, Milwaukee & St. Paul.



Underframe and Trucks Assembled.



Bettendorf Truck for 30-Ton Stock Car.

draft gear and coupler. The stop lugs are made of malleable iron castings secured to the center-sill web, and are reinforced by a heavy angle riveted to the sill. This angle is shaped like a drawbar yoke, and loops around the lugs. The draft gear is set in the pocket formed by the angles and stop lugs. The front follower is forked, with the tines passing around the front stop and resting on the coupler butt. Heavy wrought iron side links connect the rear follower to a 5 in. x 1 in. coupler key, which passes through the coupler butt.

The trucks are all-metal. They are the bolster swing-motion type used by the C., M. & St. P. on stock cars. They have the Bettendorf cast steel side frames with the journal boxes cast integral. The transoms are 6 in. ship channels terminating in malleable iron end castings. These channels carry the swinging links and axles which support the spring plank and bolster springs. The truck bolster is formed of two short 8-in. I-beams with center plate, roller side-bearings, and pressed steel chafing plates.

The absence of box sections and the openness of this underframe make inspection and painting easy. Riveting is minimized and repairs are simplified, no special tools being required. The underframe is flexible, yielding to track irregularities and making riding easy—desirable on long hauls with cattle. One of these underframe with swing-motion trucks will be exhibited at the conventions at Atlantic City.

## Railroad Cost Accounting.

BY S. M. HUDSON,
Auditor, Fort Worth & Denver City.

### II.

DIVISION BETWEEN STATE AND INTERSTATE TRAFFIC.

In this division we come to a difficult part of our subject, in that none of the costs are direct but all are common or joint, for none of our trains, either freight or passenger, are run exclusively for the one or the other class of traffic, unless a road is in territory requiring trains for suburban travel or other special service, as milk or mail. Both kinds of traffic, state and interstate, are handled in the same train, and it has been held impossible to designate the cost of each. Some people have even gone further and argued from this condition of service, that all ton miles cost the same and likewise all passenger miles.

Yet all railroad men of practical experience are emphatic in the opinion that there is a great difference, growing out of conditions of handling arising from the peculiarities inherent in the differing kinds of traffic.

Taking up the freight side first and looking at the working of an ordinary road under normal conditions, we find that as a matter of economic operation freight is loaded into cars and cars are placed in trains without regard to point of origin but are handled with reference to destination in relation to the road: if the freight goes a long distance it is placed in a through train; if it must be delivered at some station on the first freight division it goes into a local train. This, worked out, practically develops the fact that a train which goes through, that is over a full freight division without stopping to unload or load, can make more miles and can handle more tonnage, hence produce more ton miles for the cost of running the train than can a "local" stopping at every station. Hence the through train is more economical in the direct train cost and, from its more effective use of capital, of course in the common costs as well.

From this we see that in our division between state and interstate we must use a method which will assign to each its use of facilities, whether effective or not, and one which will also give opportunity to show the relative demand for economical through service or expensive local.

How much of the state business and how much of the interstate business is handled in through trains, and how effective is its use of capital?

We know, or have heard, a great deal about weight and distance being important in considering the rate to be charged, and we know the grievous attacks made on local rates because railroads handle long distance shipments at a much lower rate per ton per mile. But few seem to have considered these elements in reference to cost or to have fully appreciated their vast importance in deciding whether operation can be economical or not. Really, the weight idea should be expanded into the "weight per shipment." The shipment, as a unit, has been lost sight of, having been displaced by the "ton," and to that extent we have forgotten that the essential thing is rather the net earnings per shipment than the net per ton mile.

To better bring out various points in this connection I have prepared the following tables taken from actual traffic:

Table 1 gives the freight business for a certain period, divided between state and interstate, each being further subdivided; the state into business "local" to the line and "other" state business; interstate into business for the "state," that is, originating or terminating on the line, and that business simply passing through the state. For each of these four divisions there is shown: number of shipments, aggregate weight, ton miles and revenue. From this table is derived Table 2, where various units are shown for each class of traffic, viz.: Average weight per shipment, average distance hauled and average rate per ton per mile, together with the following resultants: ton miles produced per shipment, earnings per shipment per mile (rate into weight), and total earnings per shipment (weight, rate and distance).

With the rate running from 2.392 cents for local down to .76 cents for interstate (intermediate), we have as total earnings per shipment $7.09 for the highest rate and $13.58 for the lowest, the highest total return per shipment being $17.39 on a rate of .971 cents. This grows out of the results shown in column (4), the ton miles produced per shipment, the local giving only 297, while the highest is 1,793 ton miles. This great difference in possibilities of production and resulting gross earnings clearly illustrates the difference in value of traffic, and justifies the theory that charges out of common transportation costs must be assigned to the various classes of freight traffic on some other and broader basis than the ton mile, one which will include the differences, indicated as being factors, in the results. This also helps to make clear the justice of the division of common maintenance charges between freight and passenger on the train mile, the reasoning in both cases being the same. Because a shipment produces few ton miles is no reason why it should be favored in the division of common costs. If the shipment with high rates but producing few ton miles is favored in the matter of cost to show necessity for lower rates, what will you do about the low rate shipment? It must take care of the costs not assigned to the other. Assigning production costs on basis of shipment percents is the only justification for low rates for long hauls and the only support for the economic principle that each service furnished should pay its way and not be partially supported by some other.

TABLES 1 AND 2.

TABLE 1.—*Tonnage and Revenue.*

| State rates: | Shipments No. | Shipments Per ct. | Weight Tons. | Weight Per ct. | Ton-miles Miles. | Ton-miles Per ct. | Revenue. Amount. | Revenue. Pr ct. |
|---|---|---|---|---|---|---|---|---|
| Local | 8,832 | 20.79 | 29,121 | 8.52 | 2,616,393 | 4.45 | $62,584 | 10.72 |
| Other state | 9,659 | 22.74 | 75,577 | 22.12 | 13,202,354 | 22.46 | 131,099 | 22.46 |
| Total state | 18,491 | 43.53 | 104,698 | 30.64 | 15,818,747 | 26.91 | 193,684 | 33.18 |
| Interstate rates: | | | | | | | | |
| Interstate* | 16,886 | 39.75 | 114,654 | 33.55 | 30,245,953 | 51.45 | 293,688 | 50.31 |
| Interstate intermed | 7,097 | 16.72 | 122,392 | 35.81 | 12,724,734 | 21.64 | 96,358 | 16.51 |
| Total interstate | 23,983 | 56.47 | 237,046 | 69.36 | 42,970,687 | 73.09 | 390,046 | 66.82 |
| Total all | 42,474 | 100.00 | 341,744 | 100.00 | 58,789,434 | 100.00 | $583,730 | 100.00 |

*For state.

TABLE 2.—*Units Derived from Table* 1.

| State rates: | Average Weight pr shipmt, tons. | Average Haul, per ton, miles. | Average Rate pr ton mile, cents. | Ton-miles produced pr shipment, ton miles. | Av. earngs per mile of haul, pr shipmt, cents. | Average revenue per shipment. |
|---|---|---|---|---|---|---|
| Local | 3.30 | 90 | 2.392 | 297 | 7.89 | $7.09 |
| Other state | 7.82 | 175 | .903 | 1,368 | 7.76 | 13.57 |
| Total state | 5.66 | 151 | 1.224 | 855 | 6.93 | 10.47 |
| Interstate rates: | | | | | | |
| Interstate* | 6.79 | 264 | .971 | 1,791 | 6.59 | 17.39 |
| Interstate intermed | 17.25 | 104 | .76 | 1,793 | 13.06 | 13.58 |
| Total interstate | 9.88 | 181 | .908 | 1,792 | 8.97 | 16.26 |
| Total all | 8.05 | 172 | 1.000 | 1,385 | ..... | 13.74 |

*Maintenance of equipment.*—That portion of equipment maintenance assigned to freight service being common to state and interstate must be divided on some broad product unit. We might consider number of shipments, but that does not seem to apply to equipment; is not its product. From our knowledge of operation we see the operating man knows nothing of the number of shipments or revenue ton miles; to him all tons are the same; his unit is the gross ton, his product the gross ton mile. Revenue ton miles are a mere incident to his work; hauling empty cars, to him is just as good as loaded, provided he can get as many gross ton miles per train. Hence his work and its equipment maintenance cost is properly divisible on gross ton miles. How much may be state or interstate is nothing to him, nor does he care whether the one or the other requires the greater proportion of dead ton miles. If for any reason the state shipments cannot be or are not loaded as heavily as the interstate, its cost per revenue ton miles will and ought to be greater than that of the better loaded interstate. That is the handicap of light loading; that is the reason for minimum carload weights; that is why L.C.L. rates should be higher than carload. This is not for the purpose of allowing greater profits, but to meet heavier expense.

We will then make our division of cost for maintenance of equipment on gross tons per cent. and we think maintenance of way should be divided on same basis. For we have the two kinds of property, equipment and that over which it moves; the second sustains the first, and for the safe and successful movement of which the line and all its appurtenances are prepared and maintained. Being shut out from the employment of the use unit, train mile, by the conditions of production we must look for something else. If the one kind of property is reasonably divided on gross tons per cent., the other kind would naturally follow on the same basis, for the gross ton miles is really the joint product of the rolling stock and the roadbed.

The next thing is to find the impossible—that is, gross ton miles state and interstate—when loading is of necessity indiscriminate and we have no record of weights of cars used.

This seems so impossible that to attempt it seems useless, and even if it were possible as involving a vast amount of labor. Fortunately, we do not need the gross ton miles. If we had them we would only use them to get the relative proportion, and this can be obtained in another way.

From Table 2 we see the average weight per shipment and the revenue ton miles produced for each class of traffic. If we treat all classes alike and assign each shipment to a car we can get the relative dead weight developed by the traffic. Say we use a car weighing 16 tons, then for each 3.3 tons of local we will have 4.85 times that in dead weight, or 5.85 times the revenue ton miles for the local gross ton miles. In like manner we find "other" state business gross tons 3.05 times its revenue ton miles; interstate, for state, 3.36 times; interstate, intermediate, 1.92 times. Adding the two state together we have 55,573,079 gross tons, and the interstate in like manner produce 126,057,891. These two give as the relative percents for state 30.59 per cent. and for interstate 69.41 per cent., these being the gross tons per cent. on which to apportion all maintenance costs. This method of arriving at relative gross ton miles seems good, for it inevitably reflects results of different kinds of traffic when reduced to average units. That traffic which produces shipments of low average weight is logically handicapped as compared with the traffic producing heavy average shipments. Results so obtained when put to an operating man meet his approval if worked out on the traffic which he has been handling.

The production costs remain to be divided, and all of them except direct train cost should be divided on the relative number of shipments offered. These indirect costs have no relation to distance or weight. There is no reason why any class of shipments should be favored at the expense of the others. If one class does not produce sufficient ton miles per shipment it must pay a higher cost per ton mile.

The direct train cost, however, should be divided on a different basis, that is on basis of trains demanded by the different classes of traffic. As in the case of gross tonnage we cannot locate this cost directly, but we can arrive at the relative amount.

As previously shown, freight trains are of two classes, through and local, handled at differing average cost per gross ton mile. This has often been done by making up a manifest for each train showing way bill weight of shipment, weight of car, and destination for everything in the train, which the conductor turns in at end of run, having noted thereon any set-outs or pick-ups. From this is calculated the gross ton miles, and against this is set that train's actual cost for service and supplies. From a bunch of these manifests covering all trains for a given period we can obtain the total gross ton miles and expense, grouping through and local together, and so the cost per mile. The latest I have worked up showed cost per gross ton mile for local, 1.618 mills and for through, .509 mills. Each line will obtain its own results, which will reflect the necessities of its situation and the density and constancy of its traffic at different seasons.

The traffic shown in Table 2 was handled on a road having freight divisions of 113 miles each. From column 2 we get the average haul of each shipment. If this haul is less than 113 miles, the shipment would move in local trains at local train cost; if more than 113 it will move partly in through trains and partly in local. Local business showing average haul of 90 miles would be all at local cost, and its gross ton miles would be placed in the local column of our summary. Other state-average haul, 175 miles, would give 113 miles through and 62 in local, or 64.57 per cent. of total gross ton miles in through column and 35.43 per cent. in local. Multiplying each total of through and local by its cost we could get for the state business a cost of $61,082.16. In like manner, interstate for state, average haul 264 miles, gives 85.6 per cent. at through cost and 14.4 per cent. at local, while the interstate intermediate, from known situation of junctions, is all handled in through trains. Calculating cost as before, we have total interstate $80,380.60, which, compared with the state cost, gives us our percents of 43.18 per cet. for state and 56.82 per cent. for interstate, the expression in percents of the relative liability of state and interstate business for direct train cost based on the amount and kind of train service which would be required to handle the kind of business indicated by the average weight and length of haul of each.

The expenses assigned to passenger can be divided between state and interstate by following like lines of reasoning, allowing for the difference in the elements entering into the problem.

It would seem at first glance that passenger expense per passenger mile would be uniform and that the divisions between state and interstate should be on the basis of relative proportion of state and interstate passenger miles. Indeed, the methods which attempt to divide on the basis of some remote connection between the specific expense and each class of traffic get about the same result. And this seems the more plausible because if you use what might be called the "seat mile," that is the seating capacity of each train into its distance, you would have a unit the cost of which would be uniform, and it seems to be this idea lying dormant in the subconsciousness of investigators which brings forth the idea that each passenger mile should therefore be charged the same. But we know that all seats are not occupied during the full run of the train. Who pays for the empty seats which do not turn into passenger miles? Some one must. In fact, all who travel help, for rates are expected to pay for the full service whether utilized or net, and that necessity of operating helps us to find our basis for division. We have regular trains running fixed distances. The trains must run whether full or not; we cannot wait to get a load. Often we run regularly a train to suit patrons of the road when little more than the mere train expense is received. All these trains handle both state and interstate passengers. The average distance each class of passengers travel is different. Can we justly conclude that each passenger mile should be assessed on the same cost per mile? The only other basis of division which seems available is that of the number of passengers, state and interstate, charging each the same amount for cost, that class of business which makes the best use of the facilities thus charged for will have the least cost per mile and can claim the best rate, if the average distance traveled is great enough, as it would be to show the best use.

That "inefficient use of the facilities offered must be charged

against the inefficient user," seems most just; we might almost claim it to be a universal principle.

Could the people within 100 miles of a large city call for a daily local train, taking them into town in the morning and back at night, using only half the facilities provided by that train, and still expect expense to be charged against them on the passenger mile basis in connection with other heavily loaded trains?

To show the results by the two methods I would call attention and study to the following tables. The first shows expenses divided on basis of passengers. The second on basis of passenger miles.

I believe, aside from any reasoning in the matter, that a study of the results will convince any one that the passenger basis develops results which seem more consonant with what observation and experience tell us ought to be.

*Expense Divided on Number of Passengers.*

| | Local. | Other state. | Inter-state. |
|---|---|---|---|
| Revenue | $552,571 | $169,360 | $207,310 |
| Expenses | 347,799 | 57,029 | 64,157 |
| Net | $204,772 | $112,332 | $143,153 |
| Average distance | 89. | 186. | 246. |
| Rate per passenger mile | .026 | .023 | .02 |
| Cost per passenger mile | .0166 | .0078 | .0066 |
| Net per mile | .0094 | .0152 | .0134 |
| Net per passenger | .84 | 2.83 | 3.21 |

*Expense Divided on Passengers One Mile (Approximately).*

| | Local. | Other state. | Inter-state. |
|---|---|---|---|
| Revenue | $552,571 | $169,360 | $207,310 |
| Expenses | 259,760 | 88,323 | 120,901 |
| Net | $292,810 | $81,037 | $86,409 |
| Rate per passenger mile | .026 | 023 | .02 |
| Cost per passenger mile | .0124 | .0121 | .0124 |
| Net per mile | .0136 | .0109 | .0076 |
| Net per passenger | 1.21 | 2.03 | 1.87 |

Note the effect of the average distance traveled on the net per passenger in the first table, and compare with same results in second table and say which seems most reasonable for the service.

With the whole expense incurred to provide each passenger with service the full length of the run, it would seem as if each passenger should pay of those expenses his *pro rata*, and whether he avails himself of the full service or not is a matter beyond the control of the company.

Summarizing, we have in both freight and passenger a through commingling of state and interstate business, to which we are driven by the necessity of economical production, hence all costs are common. Freight trains are largely run according to the business offered; passenger trains without regard to the daily demands. In freight all maintenance charges are apportioned on the maintenance product, which is gross ton miles. As this cannot be ascertained under the conditions of work by keeping records, we obtain the relative amount by reducing each class of traffic to the average weight per shipment and average distance hauled, and get from these the gross tonnage which would be required to handle each class on that basis.

Production costs are miscellaneous and direct train. The miscellaneous being incurred for the business as a whole without regard to the revenue ton miles producible out of it, it is apportioned on the relative number of shipments. The train cost is apportioned on the relative amount of through and local trains required to handle the business as developed in each by average haul.

In passenger traffic we find all costs, both of maintenance and production, are for the sole purpose of producing "seat miles" and the amount accepted is by the *passenger*, his use of same being more or less complete according to his desires and not influenced by any efforts of the company in the way of maintenance or production expenditures. Hence, all passenger costs are apportioned on the relative number of passengers.

In dealing with this subject of the division of expenses, no account has been taken of mail and express, of special trains, etc. The thought has been to show a line of reasoning, to show methods of investigation and develop principles which would lead to just and reasonable results, results which, when checked against those given for other businesses, and even against our own vague impressions derived from what we have constantly seen before us, will be satisfactory and be capable of explanation on known grounds of difference in conditions of production.

If there is any good in this method, its further development so as to provide for mail and express, costs of special trains, etc., will be an easy matter. So, too, we can easily subdivide any class of traffic, as state freight business into principle items of traffic and establish cost for each.

## Cast Iron Wheels.

BY J. E. MUHLFELD,
General Superintendent of Motive Power; Balt. & Ohio.

*Summary of Conclusions.*

To improve the efficiency of the chilled cast iron wheel:

(1) Modify the guarantee feature now generally included in the specifications and particularize the mixture or analysis, or both, to insure a quality of material that will give adequate strength and resistance to heat effect from brakes, as well as uniform wear.

(2) Incorporate a manufacturer's responsibility clause which will assure good foundry practice from the time the work on the patterns and chillers is commenced until the wheel is removed from the annealing pit.

(3) As the form of the wheel pattern with respect to contour of plates or brackets and in the distribution of soft iron will obviate flange, tread, rim, plate and bracket defects which may occur in manufacturing and result from friction or impact during service, an improvement in the present generally used design, for the purpose of readily and properly dissipating heat and to provide greater flexibility, should be given consideration.

(4) Adequate coning of the tread, the ratio depending on the curvature of the line to be traversed, will reduce the train resistance as well as the percentage of wheels taken out of service for flange wear and result in their removal for tread wear, which will yield the greatest mileage.

(5) The radius of the fillet at the throat of the flange should be restricted to that which is permissible for the proper depth of chill without increasing the texture of the metal, as enlargement produces concentrated frictional contact between the throat of the wheel flange and the rail and increases the liability for a full flange climbing sheared rail when traversing curves of considerable super-elevation.

(6) Re-annealing removes inherent strains, gives greater freedom from cracked and broken plates under severe braking service and toughens the chilled portions of the tread and flange.

(7) More attention should be given to the concentric, smooth and true boring and to the accurate retaping when mating new as well as second-hand wheels; to the mounting of wheels with proper pressures to exact positions on axles with smooth, parallel wheel seats and to the maintenance of correct axle centers of trucks.

(8) Provide a suitable and flexible suspension of brake-beams to trucks and correct adjustment of brake-shoes to wheels.

(9) The body and truck bolsters should be designed to carry the maximum load at center plates having ample, true and well lubricated or anti-frictional bearing surfaces.

(10) The body and truck bolster side bearings should be spaced so that the points of contact will come within the rail head: i.e., about 50-in. spread between centers, and the clearance at each side bearing should be maintained between the limits of from ¼ to ⅜ of an inch.

(11) Maintain the center of gravity of loaded cars within reasonable distances from the top of the rail.

(12) Give more attention to the ratio of the dimensions between truck centers, between face of coupler and truck center and between axle centers of trucks.

(13) Provide adequate coupler side clearance at end sill; not less than a total of 2½ in.

(14) Reduce the vertical un-spring-borne and the lateral unyielding load on the wheels to a minimum.

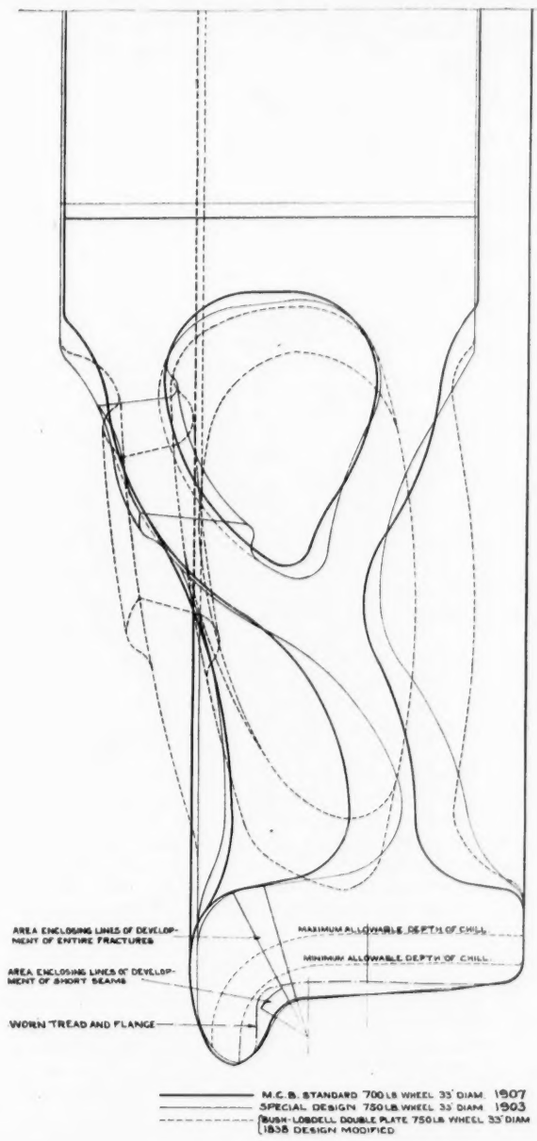
(15) Require a uniform distribution of equalized brake pressure over all wheels.

(16) Insist upon close inspection at terminals and on repair tracks for seams at the throats of wheel flanges.

It is important that the railroads and the chilled cast iron

wheel manufacturers should jointly investigate the present conditions of manufacture and service and determine, first upon a material specification, and second upon a design which will produce the most suitable chilled cast iron wheel obtainable at a reasonable cost.

The American Railway and the Master Car Builders' associations have already accomplished a great deal along the lines of improvement in the steel rail and cast iron wheel designs and a continuation of their work with a view of bringing about a corresponding betterment in the material and manufacture will soon make these essential articles entirely suitable for the requirements of efficient operation, and not only result in an ultimate pecuniary benefit to the railroads,




**Double Plate Wheels.**

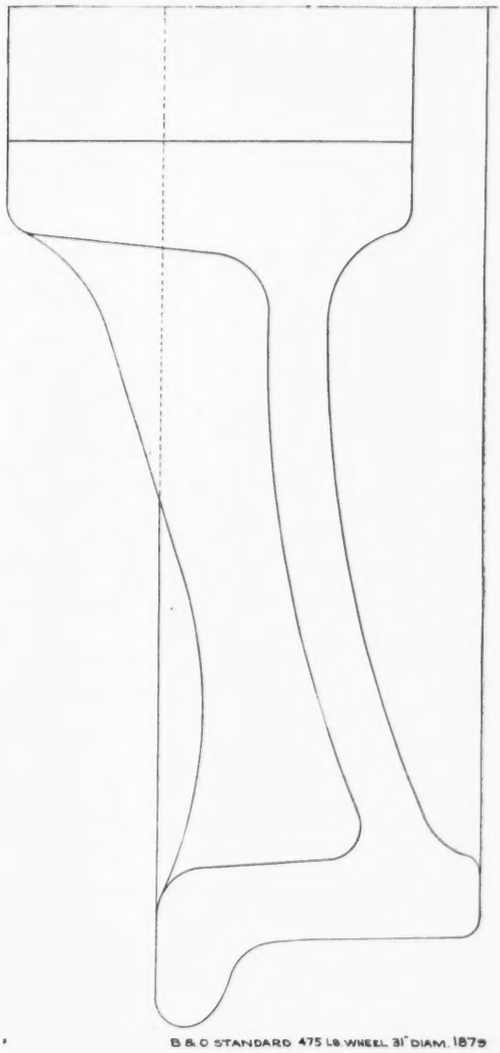
but also relieve the makers of unfair conditions and responsibilities that they may now be compelled to assume.

REFERENCE TO PREVIOUS DISCUSSION.

The concluding opinion, as given in a paper on this subject published in the *Railroad Gazette*, May 5, 1905, was as follows:

"Experiments are now being conducted with designs of wheels different from those of the generally recommended practice with a view of determining as to whether a cast iron wheel can be produced that will better meet the present and future requirements. The fact that seams at the throats of flanges have been produced by the concentrated heating effect on the flanges of wheels to which no brake-shoes were applied is evidence that when a design of rail head and tread of wheel is provided to prevent excessive frictional or rolling contact at the throat of the flange, there will be a tendency to eliminate the development of defects and the weakening effect due to the loss of metal at this point. Therefore, a slight coning of the tread of the wheel, with a minimum allowable radius of fillet at the throat of the flange, should assist in relieving wheel stresses and heating due to the concentrated frictional contact between flange and rail.

"It is thought by some that a design with a different arrangement of brackets and location of plates to provide for greater flexibility between the tread and the hub, more uniform expansion and contraction, increased strength at the rim and an increased number of brackets joining the rim tangentially, thus reinforcing the base of the flange with the greater depth of metal under the throat, will produce better results. Such a construction should reduce the liability for




**Ribbed Single Plate Wheel.**

broken plates due to continued severe brake-shoe action. The location of the plate being thrown to the outside of the rim will prevent to a large extent the breaking of the rim and cracking of the tread, and it will also give a more durable tread by increasing the chill at the point of rail contact, where the greatest wearing capacity is desired, and reducing the chill at the base of the flange and at the rim, where the least wear occurs, and the greatest strength of metal is required.

"In conclusion, it would appear that the past and present undesirable performance of the cast iron wheel may be overcome:

"(1) By designing a partial or full double plate wheel which

will distribute the metal to provide ample flexibility between the hub and the tread; strengthening directly below the rim by reinforcement of more grey iron to prevent extreme chilling and cross and longitudinal cracking; removing the depth of the metal at the tread and rail contact, which will increase the chill at the greatest wearing point; increasing the metal at the base of the flange with more grey iron to draw the chill and strengthen the throat, and providing a tread and throat contour which will relieve severe frictional contact at the throat of the flange with the brake-shoe and rail.

"(2) By the use of a uniformly good material, and proper foundry practices, processes and equipment.

"(3) By specifications, guarantees, inspections and tests of sufficient severity to insure a proper degree of endurance, mileage and safety.

"(4) By a flexible suspension of the brake-beams, that will prevent the liability of severe friction between the brake-shoe and the throat of the flange, or concentrated pressure on the rim, either on straight track or when curving.

"(5) By the adoption of simple and substantial anti-frictional side bearings and center plates, lateral motion truck device, and adequate side movement for the couplers, the design of which will not be discussed in this paper, although their application should be given serious consideration in connection with the use of either cast iron or steel wheels.

"(6) By adopting a rail head section that will conform more closely to the contour of the wheel flange.

"A construction such as recommended might bring the cast iron wheel to such a state of perfection as would make its use practicable, safe, efficient and economical in connection with the heaviest capacity freight locomotive, tender and car equipment.

"Considerable thought has been given recently to the advisability of substituting the steel wheel for the cast iron wheel. The value of such a step is as yet only problematical. If steel wheels as manufactured to-day were used in place of good cast iron wheels for freight cars the investment in the United States would be approximately $200,000,000 more than at present, or a sum sufficient to fully equip 3,500 miles of modern American railroad. It, therefore, appears that every opportunity should be given to perfecting the cast iron wheel which has given such good service under the lighter equipment, until it can be made to meet the present and future requirements or until a steel wheel can be produced that can insure equivalent or greater efficiency and economy."

DEVELOPMENT OF THE DESIGN.

In view of the general discussion and arguments now being advanced with respect to the design, material, weight, process of manufacture, performance and cost of rails and wheels, it is opportune to submit further data pertaining to the development that has taken place during the past three years in connection with chilled cast iron wheels used under heavily loaded high-capacity freight cars operated over dense traffic lines of considerable gradient and curvature and under severe hand and power braking conditions at comparatively high speeds.

It may not be out of place to mention that the history of the chilled cast iron car wheel in this country dates from the earliest introduction of tram and steam roads, the first development being a spoke pattern with the hub divided radially at three points, these spaces being filled with white metal and the hub then banded with wrought iron. Afterwards came the full double convex plate Bush and Lobdell, as well as the ribbed single plate Baltimore & Ohio types, the former originally having the hub divided concentrically, this space being filled with white metal and from which a modification in the form of the present Master Car Builders' standard, or Washburn-Atwood design, was produced, which enabled the use of a shorter axle and a lighter wheel throughout.

The full double convex plate wheel has many advantages over the present generally adopted design. It can be cast flange up and the metal as poured through the hub spreads out evenly over the bottom plate and arises uniformly and regularly in the rim tread and flange, which is filled before the pouring of the upper plate and hub is completed. Through the shape of this pattern, the plates being double convex and the hub concentrically divided, it was practically unnecessary to put the wheels through the pitting process as practised to-day, whereas with the Washburn-Atwood design the wheel must be molded and cast flange down and the same number of streams of iron as there are number of brackets flow from the hub and strike the chillers, either radially or angularly, after which the metal must divert in either one or both directions, circumferentially, which necessarily produces internal strains that must be relieved by some adequate annealing process.

However, some experience during the past three years with a special design of Washburn-Atwood type, 750-lb., of chilled cast iron wheel having the relation between the single plate and brackets with the rim as well as the tread coning and flange contour somewhat different from the present Master Car Builders' standard design, has demonstrated that more satisfactory results can be obtained so far as broken wheels and flanges and flange wear is concerned from a change in design even without a change in mixture. During the period referred to not to exceed 10 per cent. of the total number of improved design chilled cast iron wheels put into service and which represented only 6 per cent. of all cast iron wheels removed for all causes from locomotive tenders and passenger and freight cars, had to be replaced, indicating that the average life and service of such wheels will be favorable. Therefore, additional and decided betterment can be obtained from further changes in the distribution of metal, by a more suitable mixture and from good foundry practice, and this is especially true in view of the improved design of rail section as recently adopted by the American Railway Association whereby the increased radii at the junction of the crown and the sides, as well as the inclination of the latter, will materially favor the relation of the rail and wheel contours which must come in contact with each other.

SERVICE CONDITIONS.

Taking up the subject of the area of contact between the wheel and rail; a freight car, weighing 42,000 lbs. and having 126,000 lbs. of distributed lading, will give a wheel load of about 21,000 lbs. at the rail, which it is safe to assume is well within the crushing strength of chilled cast iron, or the load at which a permanent indentation might be made in the head of the rail. Under no practical operating conditions will a 33-in. diam. cast iron wheel with a tread coning of 1 in 20, when running on a 90 or 100-lb. American Railway Association rail section, under such load, average less contact than an equivalent to the area of a ½-in. diam. circle, or about 2 of a sq. in. (see drawings of relative positions of wheel tread and rail), and which is sufficient to prevent such concentration of load as would produce disintegration of a good quality of chill crystals and develop the hair line seams at the throat which are the greatest cause for broken flanges. Furthermore, under the heaviest load the location of the wheel and rail normal contact is not where these seams usually occur but the lightest load is on the wheel at the time when it is subjected to the greatest flange friction and heating, and the idea of the concentration of pressure on the contracted area of the tread being responsible for the development of seams due to the disintegration or breaking down of good chill crystals can therefore be eliminated.

With respect to the strength of the flange due to design, the line of service fracture which invariably originates as a hair line seam from the primary cause of heat, usually extends in a radial direction from the center of the circle which describes the contour at the throat of the flange. (See drawing of double plate wheels). As to the amount of the force which further develops this fracture; there are so many factors involved, such as surface, alinement and gage of track; low joints; pumping ties; curvature and super-elevation; speed; wheel and rail clearance; end play between journals and journal bearings and boxes; center of gravity of car; weight of car and lading and its distribution over the trucks; un-spring-borne weight; side bearing clearance and similar elements, that it would be difficult to determine upon any theoretical or empirical formula that would enable reasonably correct deductions.

When traversing curves one effect of the centrifugal force and change in location of center of gravity of cars with relation to the track is to cause the tread of the high wheel to lighten its load on, or rise from, the outer rail, and when there is sufficient lateral pressure this will be accomplished, more especially when full flanges with large radius throats exert a combined winding and wedging action on sheared rail

which may be too tightly gaged. With vertically worn flanges and small radius throats, while the winding and wedging action at the rail and the liability for derailment is reduced, the tendency for flange breakage should naturally be increased. However, as a chilled cast iron wheel flange failure invariably results from a seam at the throat and as the short seams usually develop from too light a chill and the deeper seams or entire fractures from too high a chill at an early stage before the flange becomes thin, the probability of flanges worn to 1 in. thickness containing inherent defects is no greater than with rails where those excessively worn from flanging seldom, if ever, are found piped due to the fact that if piped they develop defects that necessitate their removal long before they would require replacement due to wear. Furthermore, when we find that chilled cast iron wheel flanges, without seams at the throat and 1 in. thick, will withstand, without breakage, lateral thrusts and impacts such as occur at cross-overs, frogs and crossings, and which will loosen wheels by further pressing them on 7-in. diameter axle fits made with from 45 to 65 tons pressure, these conditions present maximum stresses and there is not much to fear from the standpoint of present general design and material if the latter is of suitable quality.

In regard to the effect of brake-shoe action, under fair service conditions, with brake-shoes of proper design and frictional material and correctly suspended and adjusted, no detrimental results will occur to the rim, tread, flange, plates or brackets of a reasonable pattern and quality of chilled cast iron wheel. Designs of brake-head and shoe, brake-beam and brake-beam hanger as submitted to and in part adopted by the Master Car Builders' Association last year fully accomplish the desired result by providing flexibility of brake-beam suspension and removing undesirable and concentrated brake-shoe action from the flange and rim of the wheel. Furthermore, service tests made by running identical wheels under the same rolling stock under severe service conditions with and without brake-shoes applied resulted in the wheels without brake-shoes developing seams at the throats of flanges the same as those with brake-shoes and unbraked chilled cast iron wheels used in two-wheeled pony trucks under locomotives have also developed seams at the throat which resulted in flange breakages.

### QUALITY OF MATERIAL.

Eliminating, therefore, the items of area of wheel tread and rail contact, strength of wheel flanges due to design and effect on wheel of brake-shoe action, it would appear that if a suitable type and weight of cast iron wheel is to be used the most important remaining factor is the material.

The quality of the metal now used in chilled cast iron wheels as generally produced to-day is largely dependent on the price paid per pound or per wheel, and not being covered by a specification, the purchasers are responsible for what they receive.

While the specified drop and thermal tests and the guarantee insure certain results with respect to main strength and foundry practice, they do not restrict the sulphur, phosphorus and the use of ferro-manganese with the result that the iron is brittle and will disintegrate under sudden concentrated and continuous heating due to lack of tenacity and toughness.

The generally used drop and thermal tests and guarantees have therefore failed to provide the essential resistance to breakage or detailed strength and do not represent the demands of the service, as the mixture frequently consisting of low silicon coke iron and malleable and miscellaneous cast scrap which is largely the product of coke or anthracite iron and used for cheapness; of crop ends of steel rail and old rail which are used to increase the chill by reducing the free carbon and silicon, as well as to reduce the sulphur and phosphorus; of too great a percentage of old miscellaneous high sulphur wheels which the manufacturer must take in exchange and has no other profitable way of disposing of and of the addition of a large percentage of ferro-manganese to give strength in combination with practically no charcoal iron and the use of high sulphur coke for melting, produces a most inferior quality of wheel having chill crystals which when subjected to continued and extreme flange and rail friction tend to disintegrate and produce seams due to heating, more especially where the depth of chill does not come within the minimum and maximum requirements.

This condition has been brought about by the failure of the purchaser to specify the mixture or analysis, or both, by the purchase of wheels being too much of a commercial transaction on the basis of cheapness or some fixed scale of prices with the guarantee as a protection, and on account of the practice in vogue having resulted in the new wheels being largely a remelt of former wheels lacking the essential added proportion of new live material.

### SERVICE RESULTS.

Referring to the performance of chilled cast iron wheels during the past three years under the conditions as already referred to; it may be stated that the removals and reclaims have averaged the following percentages for the different causes as given:

| Cause. | Per cent. Removed. | Per cent. Reclaimed.* |
|---|---|---|
| Broken flanges due to seams at throat | 0.35 | 0.95 |
| Broken flanges due to other causes | .10 | |
| Seams at throat of flange | 2.90 | |
| Seams in tread but not at throat of flange | 1.00 | |
| Broken through hub | .10 | |
| Broken in pieces, but not through hub | .05 | |
| Cracked plates due to heat from brakes | .60 | .30 |
| Cracked plates not due to heat from brakes | 1.30 | |
| Cracked brackets | .40 | |
| Worn through chill at tread | 3.00 | .40 |
| Worn through chill at flange | 1.40 | |
| Shelled out or brake burned tread | 5.00 | .55 |
| Worn tread when not worn through chill | 18.40 | .55 |
| Worn flange when not worn through chill | 40.90 | .00 |
| Flat or blotched tread by sliding | 19.25 | .00 |
| All other causes | 6.15 | .15 |
| Total | 100.00 | 2.90 |

*On account manufacturers' defects.

It will be noted that the number of wheels removed on account of unfair usage, such as flat or blotched treads by sliding, brake burned treads, cracked plates due to heat from brakes and other similar causes, as well as those taken out of service for flange and tread wear when not worn through the chill will make up about 85 per cent. of the total, indicating that there are many causes for removals to be eliminated other than those inherent in the wheel.

Considering the removals due to inherent defects and which failures such as broken flanges due to seams at throat, broken through hub and broken in pieces but not through hub are liable to cause accident, it will be noted that only one-half of 1 per cent. were due to these causes, and as it was possible to reclaim under the guarantee clause less than 3 per cent. of all wheels removed, it indicates not only a fairly good general performance but also the limited value of the guarantee feature as the improvement in design and material of the chilled cast iron wheel may be advanced. The fact that from two to four months' time may elapse before the manufacturers and purchasers joint decision with respect to responsibility for wheels reported as failing to meet the guarantee requirements is arrived at and that from 20 to 25 per cent. of the wheels so submitted may not be replaced, results in considerable loss in shop space and in interest on investment as well as greater cost for handling, all of which the use of an improved mixture would tend to eliminate.

### BENEFIT FROM CHANGE IN DESIGN.

It may be stated that without specifying a change in material a substantial improvement has been effected through the change in design and which embodied the following distinctive features:

(1) An increase in weight averaging between 5 and 6 per cent.

This additional metal has been found to be necessary, with the quality of material used, to provide greater strength below the flange and rim as well as in the brackets, to meet the increased carrying capacity of the equipment and the more severe brake and service conditions.

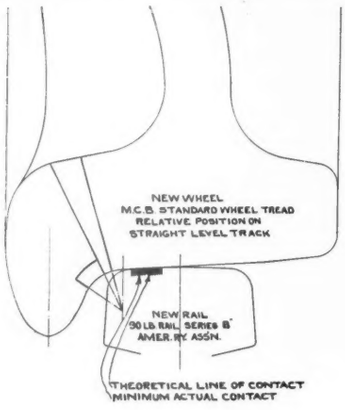
(2) An increase in the coning of the tread.

A coning was decided upon so that on a 4 or 5 deg. curve, with proper working super-elevation, the relative diameter of each wheel mated to the same axle, at its contact point with the rail, would be such as to avoid any perceptible slipping action between either wheel and rail. It has been determined that adequate coning results in lesser train resistance due to wheel flange and rail friction, an extraordinary amount of which is now represented by the wear of these parts, and that fewer seams occur which are the result of concentrated and continuous flange heating and are the most frequent and se-

rious causes for flange breakage, especially when in combination with indifferent wheel design and mixture with light or high chill. Such coning also creates a hunting or self-centering tendency where mated wheels are not of exact diameters or where track rails are not accurately gaged, and thereby prevents severe flange and rail contact until such time as the tread becomes worn to running condition, after which there is less liability for continued wheel flange and rail friction.

(3) A thickening of the metal under the flange and greater flexibility in the brackets.

This was accomplished by deepening the annular section below the flange as well as by designing the brackets to make them intersect the tread tangentially instead of radially or angularly and not only reinforce the chilled metal at the throat of the flange with a greater amount of grey iron which also has the effect of controlling the chill, but when the metal is poured the streams of iron following the brackets will tend to strike the chiller circumferentially, thereby decreasing the liability for internal strains. The arrangement of brackets with relation to the wheel center and rim also allows greater expansion and contraction of the casting as a whole without the liability of producing internal strains and fractures.




(4) A reduction of the thickness in the metal under the tread at the rail contact.

The reduced section at this point tends to increase the depth of chill at the place of greatest wear and lessens the liability for worn flat spots.

(5) A location of the single plate nearer the rim.

This has provided flexibility through a diaphragm action of the plate which better resists the stresses due to expansion and contraction on account of brake action. It also substantially reinforces the rim with grey iron which reduces the chill where it is not desired as well as the liability for transverse cracking from concentrated brake-shoe heating, and for chipping and breaking of the rim from contact with the rail at frogs, crossings and switch points.

REASONS FOR CHANGE IN MATERIAL.

However, in order to improve the efficiency of the cast iron wheel, or to express it otherwise, to obtain more substantial results from the investment as well as to further reduce the liability for failure, it is essential that a suitable mixture and analysis be specified for the following reasons:

(1) It is just as important, if not more so, for the efficient and economical operation of a railroad that the proper analysis of wheels be determined upon as for rails, boiler plate and tubing and similar materials. Furthermore, as rolling stock is subject to movement over all railroads the quality of the wheel should be made a condition of interchange.

(2) A discontinuance of the use of the proper kind, mixture and proportion of charcoal pig iron and the inauguration of the thermal test with the resulting use of ferro-manganese in combination with inferior wheel metal has contributed more to the light and high chill and development of seams at the throats of and to the breakage of flanges, than any other items.

(3) Charcoal iron of suitable kinds and mixture, when used in proper proportion, gives new life, tough metal that will resist stresses and shock due to heating and service and which will produce a suitable depth of cemented, adhesive and fine silvery chill crystals that will give uniform wear and materially assist in preventing the development of seams.

(4) The present general practice of purchasing wheels without particularizing a mixture and analysis results in a continued remelt of old wheels with a corresponding increase in the sulphur content in combination with indifferent percentages of phosphorus, combined carbon and silicon and of a large percentage of manganese not properly combined with the iron.

PROPOSED MIXTURE, ANALYSIS AND MANUFACTURERS' RESPONSIBILITY.

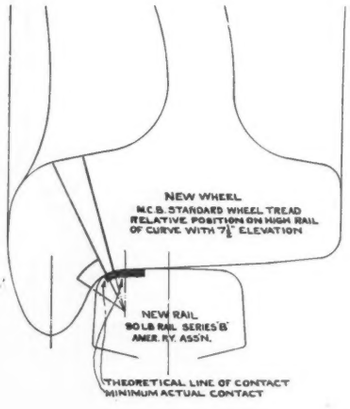
In order to insure the desired efficiency and economy, the following is submitted for consideration in connection with the formulation of a proposed revised specification:

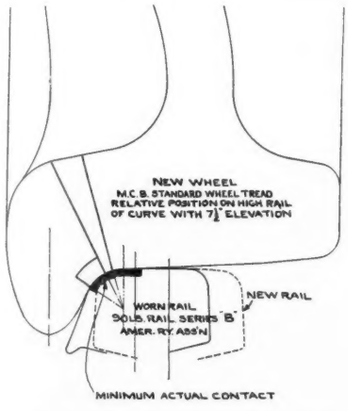
MIXTURE.

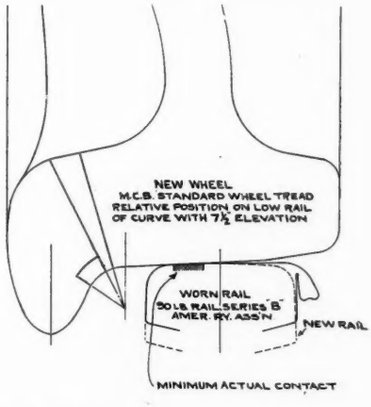
All wheels should be made of not less than 40 per cent. charcoal iron and 60 per cent. selected old wheels and foundry scrap as follows:

10 per cent. Salisbury, Conn., Lime Rock, Haman or Hunts-Lyman furnaces; White Rock, Va.; Reed Island, Va.; imported Swedish or equivalent irons.
20 per cent. Shelby, Ala.; Rock Run, Ala.; Blue Ridge, Ga.; Cherokee, Ga.; or equivalent irons.
10 per cent. Lake Superior low sulphur charcoal pig from Bessemer ores, or equivalent irons.
60 per cent. selected old wheels, wheel heads, gates, sprues, rough pig and foundry scrap from wheel heats.

100 per cent. total.




**Relative Positions of Wheel Tread and Rail, Showing Contact Surfaces.**

The use of malleable and cast scrap and of ferro-manganese will not be permitted.

*Analysis.*

| Items. | Per cent. Desired. | Per cent. Limit. |
|---|---|---|
| Combined carbon | 0.75 | 0.90 |
| Sulphur | .08 | .10 |
| Phosphorus | .40 | .45 |
| Manganese | .40 | .45 |
| Silicon | .60 | .70 |

Wheels coming within the physical test and chill requirements will be accepted without reference to combined carbon and silicon contents.

MANUFACTURERS' RESPONSIBILITY.

Wheels must conform to the design, size, weight, marking, chilling, shrinkage, mixture, analysis and physical requirements and pass the tests as specified.

Wheels rejected or failing for inherent defects which cannot be determined by surface inspection, and which may develop during machining, fitting or service like sand, slag and blow

holes; honey-combing; white iron in plates or hub; out of center or balance; warped; true shelled out spots which have raised portion in center; hollow rims and hubs and such other defects as are due to method of or carelessness in molding, pouring, annealing or handling at the foundry must be replaced by the manufacturers free of cost.

The cost for the proposed as compared with the present quality of wheel will merely be increased to the extent of the difference in price between the charcoal iron and the material which it will substitute, there being no extra expense for manufacture.

A change along these lines in the present general specification for chilled cast iron wheels would not only materially improve the performance but it would also prevent a further depreciation in quality due to some of the methods in vogue for remelting and purchasing, which if continued will displace a commodity which can be made to meet the present and future requirements for many years to come.

### RELATION OF WHEEL TO RAIL.

Much has been said and written about the corrugated, wavy and broken down depressions in rail heads as being contributed to by the greater loads, the impact from slid and worn flat spots, and the slipping or spinning of mated wheels due to the unequal length of rails on curves, particularly where chilled cast iron wheels are used under heavy capacity freight equipment.

Investigations made on various steam lines to determine the cause have developed that such rail trouble occurs mainly on the tracks over which the greatest amount of tonnage, rather than over which the heaviest steam motive power and rolling stock is moved. On such lines the difficulty predominates with the rails which have equal wear across the top of the heads of relatively wide, shallow section, and which are located on the low side of curves on the light down grades where the highest average freight train speeds are attained and where the curves have considerable super-elevation for passenger train speeds, but the majority of the traffic consists of the relatively lower moving freight trains. It also occurs to some extent with both rails on light curves and tangents as well as in exceptional instances on the high side of curves of considerable super-elevation.

As the greater weight due to the relative location of the center of gravity of motive power and rolling stock to the track will obtain on the low rail on curves it is a natural conclusion that the high rail will not be so much affected by either wear or breakdown across the top of the head, and as it has been found that localities in the vicinity of water stations and undrained and damp sub-grade, where wide gage, low joints and pumping water-soaked or otherwise depreciated ties are in evidence, are conducive to this wavy and broken down rail head condition, it is reasonable to believe that the chilled cast iron wheels now permissible under the rules governing the designing and maintenance of steam locomotives and cars are not responsible for the trouble. Furthermore, the flow or cold rolling displacement of metal across the top wearing face of the head of the rail, particularly with the softer materials in the comparatively wider and lighter sections of head where the metal at the running surface will become brittle under the successive tensional and compressional action due to the undulatory movement of the rail from the alternate application and release of wheel loads on unstable tracks where the train movement is at greatly different speeds in the one direction, has all aggravated rail trouble much more than the local pressure between the wheel and the rail, and as these corrugations, waves, dips and breakdown depressions in rail heads occur outside as well as inside of the web and usually commence at the rail joints and disappear toward the center of the rail in the direction of the greatest tonnage movement, and as they do not continue through the web or to the base of the rail except in cases of piping, it is additional evidence that the soft, ductile, segregated slag, gas shrinkage, rolling flawed and piped metal in wide rail heads of shallow depth; head worn and flowed rail and the transfer of worn rail from high to low side of curves, in combination with the before-mentioned track conditions contribute to the cause rather than the load, contact area, or longitudinal or lateral slipping action of chilled cast iron wheels under the heavier classes of equipment.

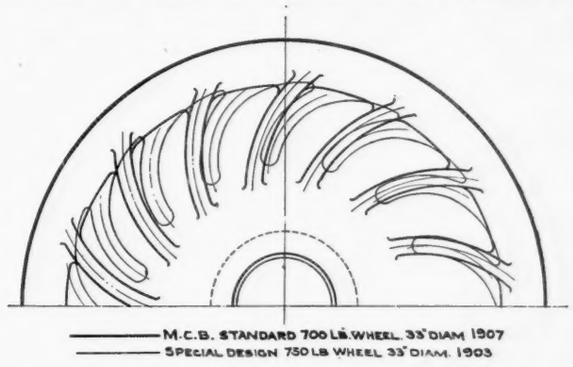
However, any jumping or hopping action of wheels as produced by wavy or broken down rail, low joints or pumping ties, will result in the development of successive corrugations or breakdown depressions and inflict greater depreciation to the rail ties and ballast, as well as to the wheel and its borne parts, than the dynamic effect of heavy wheel loads, even when such wheels may have the permissible length of flat spots.

The following table shows approximately the impact in foot-pounds from 2½ in. flat spots at the treads of 33 in. diameter wheels under 20,000 lbs. load at the rail for various speeds:

| Speed, miles per hour. | Impact in ft.-lbs. | Speed, miles per hour. | Impact in ft.-lbs. |
|---|---|---|---|
| 10 | 385 | 40 | 6,135 |
| 20 | 1,535 | 50 | 9,585 |
| 30 | 3,450 | | |

The above calculations do not take into consideration that when the number of revolutions of a wheel become sufficiently high there is the tendency for it to revolve about its center and which will reduce the hammer blow effect at the higher speeds. Furthermore, when a flat spot in a wheel comes in contact with the rail the blow is distributed over an equivalent area of the latter, whereas when a wheel passes over a gap in the rail, such as occurs at a rail joint, crossing or frog, the impact is concentrated at the two lines of contact between the tread of the wheel and the ends of the rail.

While the hammer effect produced on a rail by a wheel having a 2½ in. flat spot represents practically the same number of foot-pounds as the impact from a wheel passing over a 1¾ in. gap in the rail, still the former is a distributed load whereas the latter is a concentrated blow producing the most severe result when the wheel traverses a 90-deg. crossing or frog.




**M. C. B. Standard and Special Design Wheels.**

The 1¾ in. gap in the rail is, therefore, considerably more destructive in its action than the 2½ in. flat spot in the wheel, and when rail joints, crossings and frogs are not kept in good condition and the loosening or wear of the same results in a drop of the wheel in addition to its passing over an increased opening, the resulting foot-pounds multiply very rapidly and the hammer blow becomes most destructive, not only to the wheel but also to the axles, bearings, journal boxes, arch bars or truck side frames and other un-spring-borne parts.

So long as 33 in. diam. chilled cast iron wheel loads at the rail do not exceed 25,000 lbs., regardless as to whether a given tonnage is moved in a given time over a given piece of track in cars of 33 tons capacity, or in cars of 63 tons capacity, the result will be the same so far as the effect from the rolling stock is concerned. Every advantage, in fact, will be with the heavier capacity equipment, as to move a given amount of tonnage such as will make the maximum allowable load in cars weighing 33,000 lbs. having a capacity of 66,000 lbs., as compared with cars weighing 42,000 lbs. having a capacity of 126,000 lbs., will result in the movement of 50 per cent. more non-paying weight and of 90 per cent. more wheels as well as in a correspondingly greater amount of wheel flange and rail impact and wear, and a proportionate increase in friction and train resistance due to the lower axle loads, in tractive power required per ton of lading per mile moved and in liability for accident.

### COMPARISON OF SOLID STEEL AND CAST IRON WHEELS.

Taking up the comparisons that have been made and the

arguments advanced for the use of the solid steel as a substitute for the chilled cast iron wheels for heavy capacity equipment, the average tread wear service of ordinary mixture 33 in. diam. chilled cast iron wheels suitable for 100,000 lbs. capacity cars is about 45,000 miles under locomotive tenders having total weight in working order ranging from 100,000 lbs. to 150,000 lbs., and about six years, or 55,000 miles under freight cars having total weights under maximum allowable load ranging from 140,000 lbs. to 170,000 lbs. Although the wheels under tenders are subjected to especially severe tread service as the result from sanding rail, being braked to 100 per cent. of the light weight of tender, and on account of tender vibration, it is not exceptional for them to run from 80,000 to 100,000 miles before removal on account of worn, shelled or brake burned treads.

During a three years period recently ended, the performance of somewhat less than 300,000 33 in. diam. chilled cast iron wheels removed for all causes from all classes and capacities of locomotive tenders and passenger and freight cars, averaged approximately 68,000 miles per wheel, indicating a service result actually obtained which gives evidence of what may be accomplished by further possible improvements in design, material and foundry practice.

The relative amount of tread wear during the first half of the cast iron wheel time or mileage service, as above given, for cast iron as well as for composite and solid steel tired wheels, ranks as follows:

Cast iron .....Least amount
Composite steel tired .....Intermediate amount
Solid steel tired .....Greatest amount

The relative amount of tread wear during the last half of the cast iron wheel time or mileage service ranks as follows:

Solid steel tired .....Least amount
Composite steel tired .....Intermediate amount
Cast iron .....Greatest amount

The average service of the cast iron wheel due to tread wear is the measure for efficiency, as it has been found that the solid steel wheel will obtain worn flanges more readily than the cast iron which has less tendency to wind and cut against the rail. Furthermore, a solid steel wheel with a vertical worn flange is just as liable to contribute to derailment at frogs and switches, if not more so, than a cast iron wheel with a similar flange, and as wheels taken out of service on account of worn tread and flange and due to being slid flat and blotched will aggregate about 80 per cent. of the total removed, and as such replacements would be required with any other kind of wheels even though the inherent defects might be, but which would be impracticable, entirely eliminated, a conclusion can readily be formed as to the relative efficiency.

The following shows the predominating deficiencies that may and do develop in solid steel wheels which correspond to those which occur in cast iron wheels and necessitate removal:

| *Solid Steel Wheels.* | *Chilled Cast-Iron Wheels.* |
|---|---|
| 1. Worn flange. | 1. Worn flange. |
| 2. Flat or blotched tread by sliding. | 2. Flat or blotched tread by sliding. |
| 3. Worn tread. | 3. Worn tread. |
| 4. Shelly, flaky or brake-burned tread. | 4. Shelled out or brake-burned tread. |
| 5. Porous tread. | 5. Spongy tread. |
| 6. Cracked flange. | 6. Seams at throat of flange. |
| 7. Cracked plate. | 7. Cracked plate and brackets. |
| 8. Cracked tread. | 8. Seams in tread, but not at throat of flange. |
| 9. Broken flanges due to cracks and other causes. | 9. Broken flanges due to seams and other causes. |
| 10. Broken through hub and broken in pieces, but not through hub. | 10. Broken through hub and broken in pieces, but not through hub. |

With the solid steel wheels the shelled, flaky, porous and cracked constitute the more prominent and serious defects, and are the result of segregation, piping, gas cavities, entrapped slag, checks, heat treatment and manipulation which may occur from the time the metal is poured as ingot until the wheel is undergoing the final process in manufacture. They are also liable to brake burns, heat cracks and slip spots from braking action which tend to disintegrate the metal at the rim, tread and flange, and result in shelling, flaking and development of long flat spots with final eccentricity of tread and pounding of wheel or breakage.

Broken flanges are, of course, among the most serious failures, and in addition to being developed from heat cracks and inherent material defects may be the result of worn flat spots and from striking frog points and frog and crossing guard and wing rails and their spacing filler blocks.

While the comparative strength of the full flanges of new solid steel and cast iron wheels are as about 5 to 1, respectively, when the material is of good quality, it is not so much the high factor of safety as a reasonable factor of resistance to breakage that is desired, in order that a wheel may withstand the treatment it receives under ordinary usage and fair service conditions, and such a factor can be obtained in a cast iron wheel.

The required factor of safety is therefore largely dependent upon good design and material as well as vigilant inspection for the removal of those chilled cast iron wheels that may develop seams at the throats of flanges or other serious defects before entire fracture takes place, rather than upon the use of a wheel which may involve extraordinary and unnecessary strength and expense.

A substantial chilled cast iron wheel having a flange 1 in. thick is adequate for freight train running speeds which come well within the working super-elevation of track for curvature where the lateral pressure or thrust of the wheel flange against the rail will not exceed that due to centrifugal action or ordinary impact from track irregularities such as low joints or other deficiencies in surface, alinement or super-elevation. This has been tested out by applying wheels which had been removed from freight cars on account of flanges being worn to the $1\frac{1}{16}$-in. thickness allowable limit to a heavy capacity tender traversing lines of considerable curvature and gradient at high speed, and where the mileage made while wearing the flanges from $1\frac{1}{16}$ in. to 1 in. thick averaged from 12,000 to 14,000 miles per wheel and without any indication of defect at the time of final removal. Tests of this kind as well as general experience and practice have proven the error in making a rule requiring the removal of chilled cast iron wheels before flanges are worn to 1 in. in thickness when mated wheels are tracking properly on the rail and there is no evidence of unusual lateral pressure.

As to the comparative strength of the flanges as well as of the treads and rims of solid steel wheels when returned and worn to the allowable limit; this remains to be determined, as with these parts supported by the plate only, as compared with the plate and brackets in the chilled cast iron wheel, there is probability of failure, more particularly when the treads become hollow worn and are subjected to severe brake and other service action.

### FACTORS IN EQUIPMENT WHICH CONTRIBUTE TO WHEEL WEAR AND FAILURES.

Referring to contributing elements in the body and trucks of rolling stock which may influence wheel service, there are the height from the top of the track rails to the center of gravity and the total wheel base of a loaded car which largely affect not only the lateral pressure, but also the amount of heat generated by the friction between the wheel flange and the rail. From extended service observations it has been found that locomotive tenders and the 100,000 lbs. and greater capacity hopper cars are the most unfavorable to wheel flange friction, development of seams and breakages; the box cars rank second; the gondola cars third, and the center dump ballast cars are the most conducive. The rolling of the comparatively high center of gravity cars over the truck bolster springs and center plates, in combination with the shorter total wheel base, tends to relieve as well as to distribute the wheel flange stresses due to rail contact in the same manner as has been found to be the case with steam and electric locomotives. The augularity of the longitudinal center line of each truck in its relation to the center line of the tender or car is materially lessened with a short as compared with a long distance between truck centers, when curving, and the lateral pressure and thrust is therefore not only reduced but also more equally distributed between all wheels and the rail.

Cars having the ends overhanging the trucks unnecessarily, due to a considerable distance between the face of the coupler and the center of the center plate, have also developed extreme cases of wheel flange friction and breakage, and it is important that this dimension be reduced to the minimum, more especially with the longer equipment.

Another important factor is the substantial designing of the body and truck bolsters so that the ultimate weight of

car body under maximum lading may be carried on large area well lubricated or anti-frictional center plate bearings and with not less than ¼ in. or more than ⅜ in. clearance at each side bearing.

The general designs of arch bar trucks having comparatively short distance between axle centers, more particularly when in combination with longer car bodies having extreme distances between truck centers, have also contributed materially to wheel flange friction and to a tendency for derailment due to increased truck swiveling or pivoting resistance.

The application of a simple and durable lateral motion device to tender and freight car trucks is of considerable importance, and in combination with adequate coupler side clearance at the end sill will be of material benefit in reducing wheel flange and rail impacts and friction and the consequential results.

GENERAL.

The preceding conditions with respect to wheels and rolling stock to which must be added the higher continued average speed of trains around curves, have materially increased the work of the wheel flanges and aggravated flange heating and the development of partial and entire fractures. However, regardless of the development of the cast, rolled or forged solid steel wheels, the use of the chilled cast iron wheel which has contributed as much if not more than any other article to the rapid advacement of railroad development in this country, must be continued for some time to come if for no other reason than from the standpoint of the necessary supply to meet the demands for new equipment and renewals.

In many respects the cast iron wheel is an ideal one for railroad service. It is a single piece of metal having a very hard, durable tread with a tough center, and can be manufactured economically and in large numbers of uniform quality in almost any part of the country with comparatively inexpensive facilities. When made of good design and material, of sufficient weight, and by proper foundry practice, it can fulfil the requisites for operation and safety most satisfactorily for a minimum initial investment and operating cost, as the differential between the new and scrap weight and value is less than for any other article so generally used for railroad service where the requirements are so great.

The cost for handling, boring and mounting new and to remate partially worn cast iron wheels requires but few facilities and is an economical procedure as compared with the facilities and cost to do similar work and to return or regrind solid steel returning tire wheels.

The greater interest on the investment and differential in weight and value of the material in the new, second-hand and scrap solid steel wheel of present manufacture, will necessitate a first cost of somewhat less than double that for a good chilled cast iron wheel in order to insure a comparative efficiency per 1,000 miles run. Furthermore, with the restricted truck clearances and the established heights of loaded and empty freight cars, a returning tire wheel, on account of the considerable variation between the minimum and maximum diameters at the tread, will involve extraordinary expenditure and delay for the maintenance of the required clearances and of the allowable dimensions between the top of the rail and the center lines of the couplers and axles.

Therefore, until a one-mileage solid steel wheel, with hardened tread and flange wearing surface which will not involve the loss of material and the labor expense and time required for returning treads and flanges and readjusting heights of cars can be produced having considerably less weight and greater service value than a good chilled cast iron wheel, and which can be sold on a specification, test, mileage and exchange basis, similar to the latter, the use of the solid steel wheel for freight service will be somewhat of a luxury.

Furthermore, from past experience with steel commodities it is evident that the solid steel wheel must pass through an expensive experimental stage, more particularly with respect to quality and heat treatment, as well as in manipulation and reduction of metal during manufacture, and it is advisable to confine its use for the present to purposes of economy rather than to unnecessarily increase the already too high operating costs of railroads.

There is great need at present for a perfected solid steel returning tire wheel to substitute the composite steel-tired wheels now in general use for high-speed service where the impact and braking conditions are especially severe, and as the capacity of the present solid steel wheel manufacturing plants will not exceed 500,000 wheels per annum the demand for their output for this purpose should give opportunity for continued substantial development.

## New York Central Multiple Unit Train Service.

BY C. H. QUEREAU.
Superintendent Electric Equipment, New York Central.

The following will be of interest chiefly as expressing the opinions of one whose railroad experience, until quite recently, has been confined to steam railroad equipment and methods. These are based on an experience of about a year and a half with the multiple unit equipment of the New York Central, used in its suburban trains out of New York City, and should not be applied to any problem where conditions are materially different.

Plans have been approved for electrifying the main line of the Hudson Division as far as Croton, 34 miles, and the Harlem Division as far north as North White Plains, 24 miles from Grand Central Station, the New York City terminal. At present the electrification extends only 15 miles on the Hudson Division, terminating at Yonkers, and to Wakefield, 12.6 miles on the Harlem Division. These points are the northern termini of the Initial Electric Zone. Beyond these points the trains are handled by steam locomotives. On account of these conditions it was necessary to equip the cars with both electric and steam heat apparatus and two systems of lights, electric and gas. Though the motormen handling the electric equipment are all ex-steam locomotive engineers, it would be impracticable for them to be responsible for and handle the trains electrically to the end of the Initial Zone and then by steam locomotives to the end of the run. On this account the motormen are not used to as good advantage as they will be when full electrification is an accomplished fact instead of an approved plan.

OPERATING RESULTS.

Leaving out of the discussion for the present the matter of cost, the operating results have been very satisfactory and the multiple-unit equipment has shown a number of advantages over the steam equipment for suburban service.

All of the motormen now handling the electric equipment were steam locomotive engineers. They have taken very kindly to the new equipment and conditions, and proved themselves very apt and skilful. As a rule they have been qualified as motormen after a short period of instructions. It should not be inferred that at the end of this schooling they were as competent as they have since become, but that so far as the handling of the equipment was concerned, the detecting and replacing of blown fuses and similar necessary qualifications they were satisfactory.

There is no use denying the fact that while the trains were handled by steam locomotives, the Park avenue tunnel, just north of Grand Central Station, was seriously objectionable to a large number of passengers, was enjoyed by no one, somewhat retarded the natural growth of suburban business, and, in spite of the elaborate systems of signals, visible and audible, and a large force of flagmen and checkers, involved more possibility of accident than any other piece of track in the suburban district.

The substitution of electric traction, because of its freedom from steam and smoke, has removed these objections and materially increased the capacity of the tunnel by giving an unobstructed view of the signals to the motormen, thus allowing a materially shorter safe headway between trains and higher speed.

Suburban passenger traffic is limited to a comparatively short radius, say 25 miles, and requires a number of trains at short intervals. When this traffic is handled by steam locomotives, at the end of each trip it is necessary to, at least, run the engine around its train and, in the majority of cases, to put it over the turntable. In addition, it must go over the clinker pit, to the water plug, coal chute and sand house several times a day, and to the roundhouse for inspection once a day. At a busy terminal this shifting and attention considerably increases the yard movements, thus decreasing the useful capacity of a terminal, requires ground room for the turn-

table, clinker pit, coal chute, water plug and sand-house, and a payroll for the necessary employees. In a passenger terminal where the trains are operated by steam locomotives, approximately two-thirds of all the yard movements are made necessary by these non-revenue movements of the motive power.

If the trains are made up of electrically operated multiple-unit cars, with a motor car at each end, it is evident that no yard space or attendants are needed for a turntable, coal chute and other facilities or the non-revenue yard movements required by the steam locomotive.

The flexibility of operation and economy of time of the motor car trains is particularly noticeable in switching movements between the station platforms and storage yard. In suburban train operation there is a heavy movement to the city in the morning and in the reverse direction in the evening. With the steam operated trains, it is easy to understand that during rush hours there must be several switch engines and numerous flying switches, which are hazardous, or serious delays in the movement of trains from and to the loading platforms. With the multiple-unit trains, as soon as the passengers are unloaded, without waiting for a switch engine, the trains can be moved from the platform into service or the storage yard and when the current of travel reverses can be handled as promptly.

This ability to handle motor equipment promptly materially increases the traffic which a given platform and yard capacity can handle.

Our multiple-unit cars receive the same terminal attention as the regular passenger equipment, so far as air brakes, journal boxes and cleaning are concerned. In addition they are sent to the inspection shed after each thousand miles they have run, once in ten or twelve days, where the electric apparatus, which replaces the steam locomotive, is inspected and receives any necessary attention. The steam locomotives receive a similar roundhouse inspection and attention once in every hundred or hundred and fifty miles, and it follows that the electrically operated cars can be more continuously in service than the steam locomotives.

In this connection there is an interesting development in connection with our electric equipment. We have a number of extra parts, such as motor and trailer trucks, motors, contractors and controllers. In fact, duplicates of all important parts. As a consequence, when a part, such as a motor, needs general repairs, either because of accident or wear, the car is sent to the shop for only such a length of time as is necessary to replace the defective part with one in good order. The car is returned to service in a few hours, seldom more than twenty-four, and repairs are made to the defective parts at leisure. Our experience so far indicates that because of this policy and possibility the electric equipment will need to be shopped for any considerable length of time only for painting, at least for a number of years. While this plan can be applied to steam locomotives to a limited extent, a number of the vital parts, such as boiler and valve gear, cannot be so handled. On this account it seems reasonable to believe that the electric equipment cannot only be kept more continuously in service than steam, but at an average higher state of efficiency, which means less delays to trains. Though our experience to date indicates the soundness of this conclusion, it is altogether too limited to warrant a positive statement.

There is less dead weight in a multiple-unit train than one of the same seating capacity handled by steam. The electrical apparatus increases the weight of the motor cars about 20 per cent., but as two motor cars are capable of making time with an additional trailer, the electrical apparatus increases the weight of a multiple-unit train only about 12 per cent. The weight of the steam locomotive is a greater percentage of the weight of the steam train. A comparison, based on actual conditions, shows that the weight of our steam operated suburban trains including the engines is from 10 to 30 per cent. greater per passenger than those electrically operated. As the gross cost of traction power varies approximately with the tonnage handled, this difference in the weight of the two classes of equipment is a substantial credit for the multiple-unit train.

A particularly valuable characteristic of the multiple-unit trains for suburban traffic is their ability to accelerate very rapidly. This is particularly important for local service where station stops are made at two minute intervals. In tests made during the investigation preceding the decision of the New York Central to adopt the present electric traction, it was shown that, while the steam locomotive developed practically the same tractive effort as the motor car in starting, it almost immediately fell off and decreased more rapidly with increasing speed. The following table shows the results of acceleration tests of a steam locomotive, specially designed for suburban work, and two motor cars, each train having one trailer car. In each case the maximum power was used:

| | Miles per hr. in— | | |
|---|---|---|---|
| | 10 secs. | 20 secs. | 30 secs. |
| Motor cars | 22.5 | 34 | 38.2 |
| Steam locomotives | 14 | 25 | 31.7 |

These comparative results are daily confirmed under service conditions and permit a faster schedule or lower maximum speed for the multiple-unit trains.

OPERATING COSTS.

There are certain conditions where electric traction on steam railroads is, and probable will be increasingly used for other reasons than cost. At present its use is confined practically to tunnels, where the steam and gas from steam engines is a nuisance and increases hazards. But in the long run electricity will displace the steam locomotive only when it can be proved with reasonable certainty that the resulting economy will warrant the investment of the necessary capital. At present it is extremely doubtful if this has been done convincingly, as it is necessary to make a number of assumptions in arriving at conclusions, heavy electric traction under steam railroad conditions having been in operation too short a time to determine final maintenance costs on the one hand, and on the other the conditions are not entirely favorable to electricity, the power houses, transmission lines and substations having a capacity very much greater than present requirements.

Careful records are being kept by the different departments involved and statistics compiled by the General Superintendent of the Electric Division, which in the course of a few years will be extremely valuable in settling the question.

In this connection, it may not be amiss to suggest that electrical engineers and manufacturers of electrical apparatus will very much hasten the adoption of electric traction by steam roads if they can materially reduce first costs.

It is frequently assumed that the New York Central decided to electrify its New York passenger terminal and suburban district as an operating economy. The fact is that a law was passed by the New York legislature forbidding the operation of passenger trains by steam locomotives south of the Harlem river after July 1, 1908. Under these circumstances the electrification of the whole suburban district was decided on.

Because electric power can be generated at a power house where cheap coal, return flue boilers, condensers, feed water heaters, compound steam turbines and other refinements, impossible or impracticable for steam locomotives, can be taken advantage of to reduce the cost, it is sometimes assumed offhand that electric traction must be cheaper than steam. Such a generalization should take into account as an offset the fact that electric traction necessitates the purchase, installation, housing and repairing of apparatus of at least three times the horse-power capacity of the steam locomotives displaced, not to mention power houses, transmission lines, substations and storage batteries. At the power house, first, an equal horse-power in steam engines or turbines; second, an equal horse-power in electric generators; third, on the equipment, an equal horse-power in electric motors. Though the cost of fuel and labor to produce an electric horse-power may be less than that produced by the steam locomotive, it may easily happen that the interest on the necessary investment together with the losses of transmission and conversion into tractive effort will more than offset the saving.

Multiple-unit trains require a third rail or overhead trolley. In New York City it is necessary to use the third rail. This adds appreciably to the cost of the tracks, not only in first cost, but particularly in maintenance. It increases the cost of track maintenance not only by the amount necessarily expended in keeping up the third rail itself, but more particularly increases the cost of regular track work because it is in the way and the track men work at a disadvantage on account of the possibility of short circuits and danger to

themselves. While it is true there have been no fatalities to employees in the track or train service because of the third rail in the year and a half of electric operation, it does not require a particularly vivid imagination to reach the conclusion that its presence hampers the workmen and increases the cost of maintenance.

The third rail is a source of additional expense in another direction. Whenever a car is derailed one of the usual results is the breaking down of the third rail. On track as busy as that of the Electric Zone, particularly south of Mott Haven, where the same tracks are used by the Harlem and Hudson Divisions of the New York Central and by the New Haven road, it is very important that the third rail should be in operating condition as soon as the track is cleared. To insure this result there is an emergency gang of third rail men which appreciably increases the cost of track maintenance. While it is probable that the present cost of track and third rail maintenance will be materially reduced as the result of experience, it will certainly be a permanent appreciable charge against electric operation. Just what the ultimate cost will be it seems unwise to prophesy.

The cost of the electrical apparatus on a six-car multiple-unit train consisting of four motor and two trailing cars, is about 35 per cent. more than a steam locomotive capable of handling the same train. The cost of an electric engine is from 75 per cent. to 100 per cent. greater than that of a steam locomotive for the same service. To these first costs must be added that of the power houses, transmission lines including third rail, substations and storage batteries.

If the block signal system in operation before electrification requires the track rails as a part of the circuit, this must be replaced, because the current which operates the trains, returning through the track, will destroy the signal instruments or produce false signals. The New York Central has invested approximately $250,000 for new block signals in the Initial Electric Zone on this account.

Enough has been said to warrant the preceding statements that it may easily happen that the interest on the necessary investment together with the losses of transmission and conversion into tractive effort will more than offset the saving.

Under present conditions the cost of inspecting and maintaining the electric equipment is encouraging, not nearly as low as some enthusiasts have prophesied nor so high as to be prohibitive, but as none of it has been in service long enough to require a general overhauling, except painting, and it has not been necessary to renew any important parts, it probably would be misleading to prophesy what it ultimately will be. Judging by the facts already given as to the comparative first cost of electric and steam equipment, it is evident there will be a material increase in the cost of maintenance as soon as the electrical apparatus requires renewal.

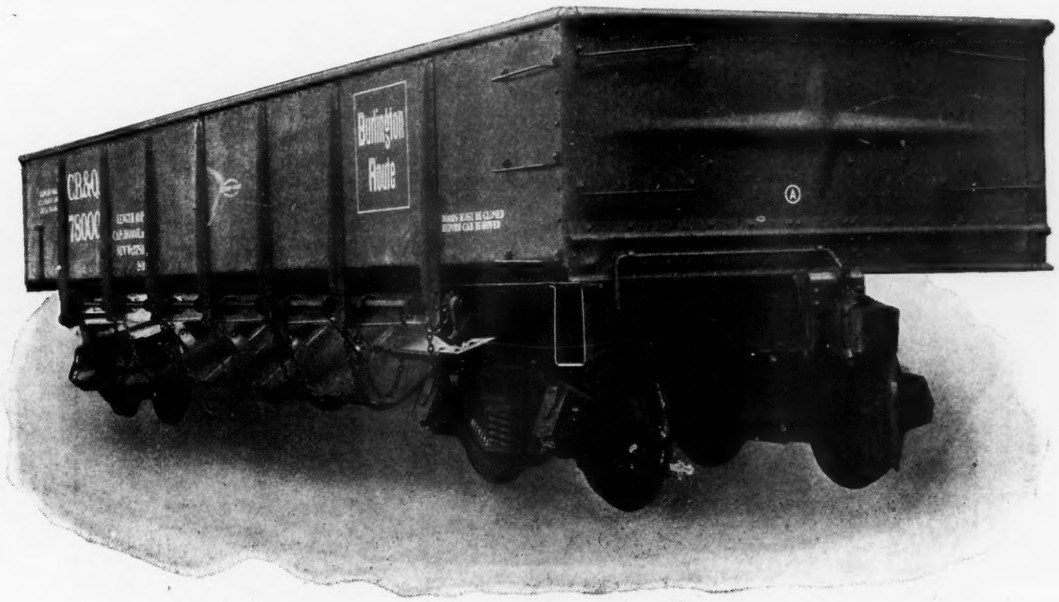
CONCLUSION.

Our experience to date has shown that, from an operating standpoint, electric traction is successful and efficient, and has a number of advantages over steam, for the territory now covered. It does not warrant the conclusion that electric traction is cheaper than steam. For reasons already given, it would probably be misleading to attempt to draw any conclusions as to their ultimate relative economy. Under conditions where other considerations than costs are the determining reasons, electric traction on steam roads will, in all probability, be adopted quite extensively in the next few years, but, in the long run, its adoption under other conditions will undoubtedly be determined by its cost, and for the present at least this is an unsettled question.

The matter of operating costs, based on present knowledge, has been very fairly and ably discussed by Mr. George Gibbs on page 400 of the April, 1908, *Proceedings* of the American Society of Civil Engineers.

## 50-Ton Steel Gondola for the Burlington.

The Chicago, Burlington & Quincy has had built by the Bettendorf Axle Co., Davenport, Iowa, 1,000 50-ton all-steel, drop-bottom gondola cars, photographs of which are reproduced herewith. They are attractive in appearance and the efforts of the builders to secure a light, yet exceedingly strong, construction resulted in some novel features of design.




Burlington Steel Gondola.

The car is an unusually open type, making inspection easy. The majority of the different members are of standard rolled sections, easy to obtain and to apply. In the side and end sheet construction are found some of the novel points. Instead of the ordinary top chord angles, the side coping is formed by rolling the sheet at the top to a tube form, 2¼ in. inside diameter. The end sheet has a heavier top roll and is stiffened further by a heavy corrugation to enable it to withstand the heavy shocks of the coal service. The builders have endeavored to combine in this car the two lines along which designers have generally worked, namely, that in which the load is carried on deep center sills, the side sheets being considered as having no carrying value, and the reverse condition, where the center sills are lighter members, acting primarily as draft columns. In the present design, the sides and center sill are allowed to carry their respective loads, but the carrying power of the different members has been unified to give a design in which no one part is unduly stressed, or requires an abnormal section to gain the necessary strength.

The car is 40 ft. long, 9 ft. 6 in. wide and 51 in. deep, inside

dimensions. The side sheet is ¼ in. steel, shaped at the bottom with a wide sloping flange, to avoid pocketing material when the car is dumped. Each side is made up of two sheets, spliced at the center by the center stake and a heavy splice plate. The sheet is stiffened by pressed steel stakes, seven to the side. Each stake is riveted to the end of a needle-beam a length of 10 in., to withstand against side thrusts. The end sheet is made with the deep, heavy top roll already mentioned, and is flanged at the corners for connection to the side sheets. It is further stiffened by a large star-shaped corrugation, 3 in. deep. It is made of ¼ in. steel and is cold-shaped during the different operations. The end sill is riveted to the sheet and is made of a 10-in. channel, the top flange of which is bent upward to lie flush against the end sheet, and the web is shaped in a long, straight corrugation across the car. Poling pockets are also pressed into the channel web. The end sill is shaped in one operation with the metal cold, the severity of treatment given it preventing any but the best grade of open-hearth steel being used.

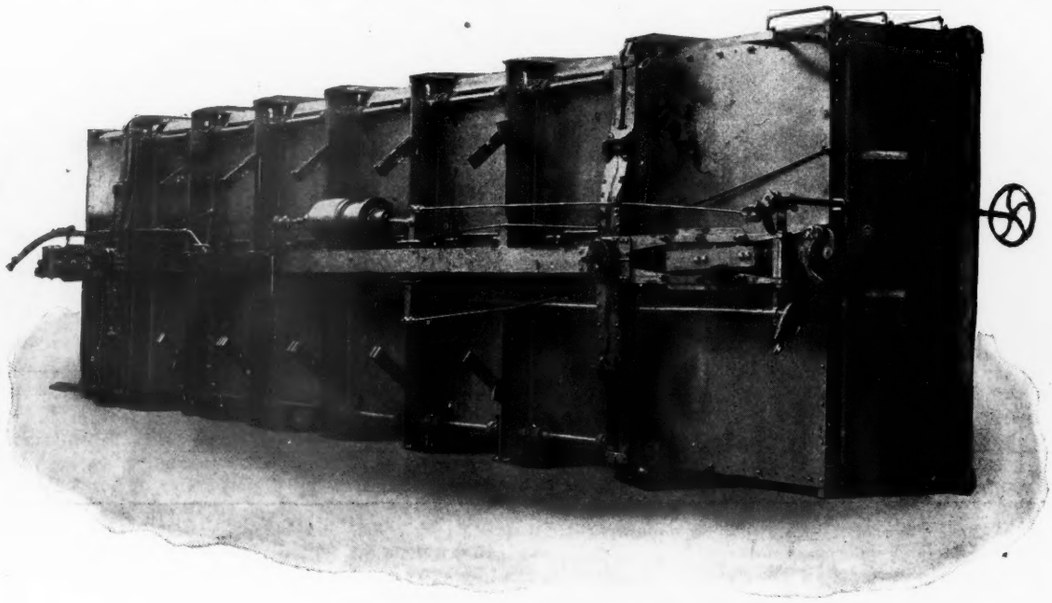
Like the Union Pacific steel box car, this car has a single center sill, which is strong enough to carry the entire load, but under uniform loading carries only 58 per cent. of it. It is made up of three members: a 24 in. 80 lb. I-beam, an 18 in. cover plate, and the center-sill ends, or draft sills. The I-beam extends between the bolsters, the web being cut out at each end and the bottom flange thrown up to reduce the depth at the ends from 24 in. to 15 5/16 in. The draft sills are cast steel, with draft lugs cast integral, and are arranged in this instance for Miner tandem draft gear. They could, of course, be designed for any draft gear desired. The draft sills extend from the striking plate to the back of the body bolsters, and are riveted to the center sill with heavy rivets. The body bolster is continuous, passing through the draft sills and securely riveted thereto, both at top and bottom. The cover plate runs the entire length of the car. The drop-door hinge butts are riveted to the cover plate and the web of the center sill. Permanent floor plates of 5/16 in. steel extend from the body bolster to the end sill, and are riveted to the side sheets, the center sill compression plate covering the joint of the plates.

Five 10 in. I-beams and two Bettendorf body bolsters constitute the cross-ties. Each needle-beam has been made strong enough to transmit its load to the center sill, and because of the beam being continuous from side to side of the car, it does not depend on rivets to properly perform its duty. The top flange of the center sill is set down to allow the top of the needle-beam to come flush with the floor level, thus avoiding cutting this flange.

The load is dumped by means of 12 drop-doors, worked by winding chains and a shaft 2¼ in. in diameter. The doors are made of 5/16 in. steel, flanged and secured to the center sills by malleable iron hinges. Steel hangers riveted to the needle-beams catch the doors and relieve the winding chains of all strain when the load is dumped. The dumping mechanism is the creeping-shaft type, and is protected from injury by the bottom flange of the side sheets.

The trucks are the Bettendorf standard cast-steel side frame, 50-ton type. This design of truck has been described in the *Railroad Gazette*. It has the journal boxes cast integral with the side frames, and dispenses with arch-bars, columns, bolts, etc. The use of this side frame reduces the weight of trucks per car about 1,000 lbs. and eliminates nearly 200 pieces per set of trucks. The light weight of the car is 37,800 lbs., and of the trucks alone, 14,260 lbs. The open and simple construction makes inspection quick and thorough. As there are only a few hot pressed shapes, repairs can be made more easily at small division points; also the various members do not have their iron oxide coating destroyed by reheating, enabling them to better resist the corrosion. The construction is considered capable of withstanding the heaviest kind of service. A car of this design will be exhibited at the Master Car Builders' and Master Mechanics' conventions, at Atlantic City, N. J., June 17 to 24, inclusive.

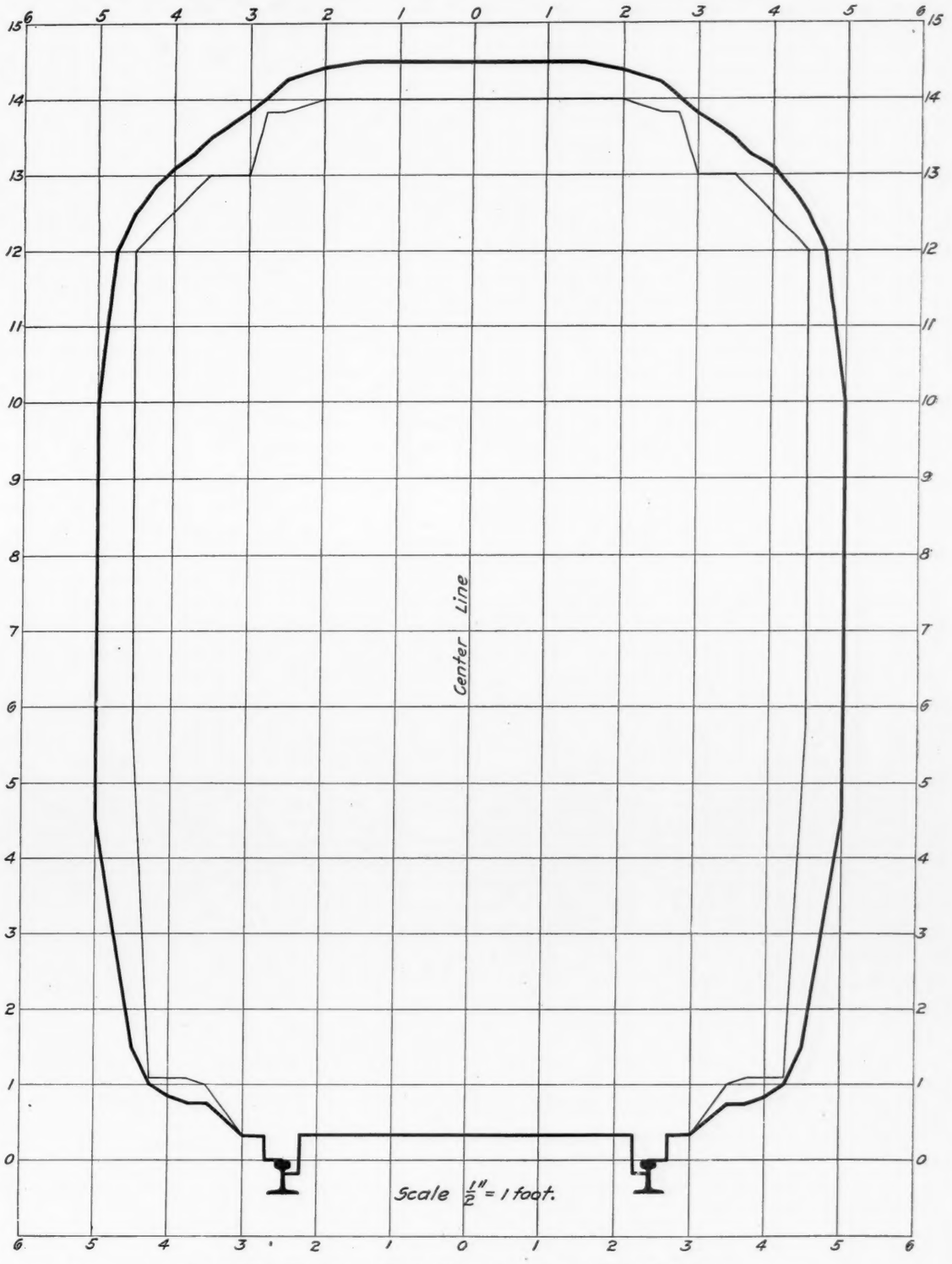
Inside View, Burlington Steel Gondola.



Bottom View, Burlington Steel Gondola.

### Car Clearances.

The accompanying diagram shows the composite minimum car clearances allowed on the larger roads in North America. The heavy line refers to through routes and the lighter to local lines. Further details are given in the editorial columns. The roads whose clearances were used are as follows: The Atchison, Topeka & Santa Fe, the Atchison, Topeka & Santa Fe Coast Lines, the Atlantic Coast Line, the Baltimore & Ohio, the Baltimore & Ohio Southwestern, the Boston & Albany, the Boston & Maine, the Buffalo, Rochester & Pittsburgh, the Canadian Pacific, the Central New England, the Central of New Jersey, the Central of Georgia, the Central Vermont, the Chesapeake & Ohio, the Chicago & Alton, the Chicago & Eastern Illinois, the Chicago & North Western, the Chicago, Burlington & Quincy, the Chicago, Cincinnati & Louisville, the Chicago Great Western, the Chicago, Indiana & Southern, the Chicago, Indianapolis & Louisville, the Chicago, Milwaukee & St. Paul, the Chicago, Rock Island & Pacific, the Chicago, St. Paul, Minneapolis & Omaha, the Chicago Terminal Transfer, the Cincinnati, Hamilton & Dayton, the Cleveland, Cincinnati, Chicago & St. Louis, the Colorado & South-




Composite Clearance Limit Diagrams of American Railroads.

ern, the Delaware & Hudson, the Delaware, Lackawanna & Western, the Denver & Rio Grande, the Detroit & Mackinac, the Detroit, Toledo & Ironton, the Erie, the Galveston, Harrisburg & San Antonio, the Grand Trunk, the Great Northern, the Gulf, Colorado & Santa Fe, the Hocking Valley, the Illinois Central, the Intercolonial, the Kansas City Southern, the Lake Erie & Western, the Lake Shore & Michigan Southern, the Lehigh Valley, the Long Island, the Louisville & Nashville, the Maine Central, the Mexican Central, the Mexican International, the Michigan Central, the Minneapolis & St. Louis, the Minneapolis, St. Paul & Sault Ste. Marie, the Missouri, Kansas & Texas, the Missouri Pacific, the Mobile & Ohio, the Mobile, Jackson & Kansas City, the Nashville, Chattanooga & St. Louis, the New York Central & Hudson River, the New York, Chicago & St. Louis, the New York, New Haven & Hartford, the New York, Ontario & Western, the Norfolk & Southern, the Norfolk & Western, the Northern Pacific, the Oregon Railroad & Navigation Co., the Oregon Short Line, the Pennsylvania Lines West, the Pennsylvania Railroad, the Pere Marquette, the Philadelphia & Reading, the Queen & Crescent Route, the Rutland Railroad, the St. Louis & San Francisco, the St. Louis Merchants Bridge Terminal Railway, the St. Louis Southwestern, the San Pedro, Los Angeles & Salt Lake, the Seaboard Air Line, the Southern Railway, the Southern Pacific, the Terminal Railroad Association of St. Louis, the Texas & Pacific, the Toledo & Ohio Central, the Toledo, St. Louis & Western, the Union Pacific, the Vandalia, the Wabash, the Western Maryland, the Wheeling & Lake Erie and the Wisconsin Central.

### 100,000-lb. Steel Ore Car.

The Chicago & North-Western is having built 500 steel ore cars of 100,000 lbs. capacity to the design shown in the accompanying drawing. These will be the first all-steel ore cars for the North-Western, the present equipment being wood or composite construction. Steel is used throughout in this design because of the higher capacity—80,000 lbs. being the maximum used heretofore—and the growing scarcity and cost of suitable lumber.

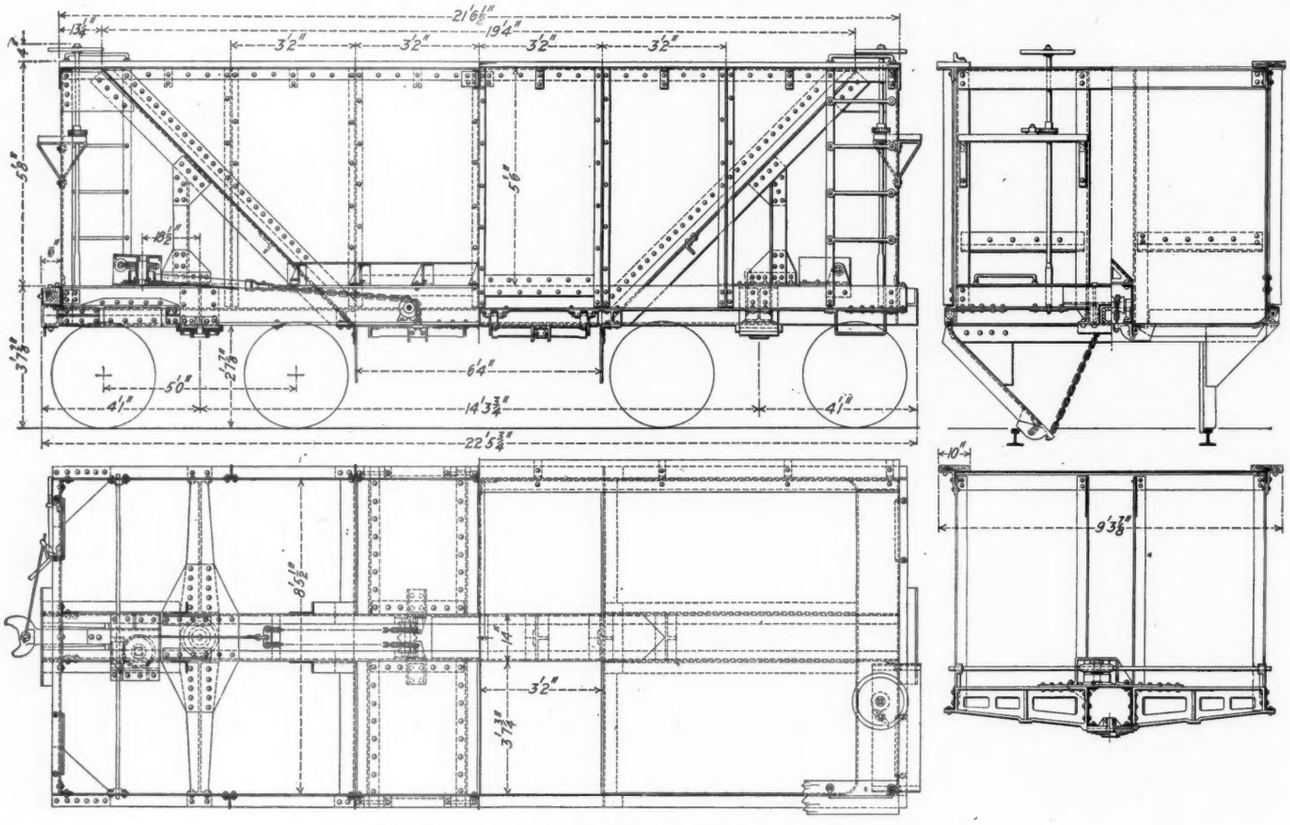
The car is 22 ft. 5¾ in. long over end sills and 24 ft. between contact faces of drawbar knuckles. These dimensions are necessitated by the distance between pockets on the ore docks, which is 12 ft. The cubical capacity of the car is 644 cu. ft. and the openings in the bottom have an area of 46.2 sq. ft. to insure free dumping of the load and a minimum of stoking.

The center sills are 12-in. 30-lb. channels running the full length of the car, and arranged as nearly as possible in girder form. Each side sill is a 3½-in. x 7-in. x $\frac{7}{16}$-in. angle, having the side posts and plates riveted thereto. The end sill is a 7-in. channel with the bottom flange cut out over the drawbar for the housing casting. The body bolster is a one-piece steel casting, the design having been modified since the drawing here shown was made. The dead block is wood to provide a cushioning element, and the draft gear has a resistance capacity of 300,000 lbs. Provision is thus made for absorbing extraordinary buffing shocks received at the drawbar.

The drop doors are hinged high enough to avoid scraping on the ties or dock timbers when lowered, and are so curved that when lowered for dumping they form a hopper for discharging the load between the rails into the dock pocket. Small apron pieces at the ends of the doors prevent the ore from dropping on the track. The corners of the hopper, where the side and end plates join, are rounded to a radius of 3 in. to facilitate the discharge of the ore.

The dumping apparatus consists of a worm gear with a winding drum of such size that a turn and a half gives the desired amount of movement. A shaft extends from the gear to each side of the car, from which the gear is worked by means of a bell-crank lever. A flat steel cable, 2 in. wide and ⅜ in. thick, connects the winding drum with a chain running between the center sills and across sheaves above the doors.

Four stoker holes 1¾ in. in diameter are placed in the sides of the car for the insertion of steam pipes in winter for thawing frozen ore. These holes are not shown in the drawing. Yellow pine running boards 10 in. wide extend around the four sides of the car at the top. They are principally for the use of the stokers in unloading and trimming the car. There are two brake cylinders worked from one reservoir and triple valve, on account of the inability to extend the brake connections satisfactorily between the center sills. There are hand




100,000-lb. Steel Ore Car; Chicago & North-Western.

brakes at each end of the car, intended principally for the use of the miners at the tipples. The car weighs approximately 31,000 lbs.

### Railroad Building in South America.

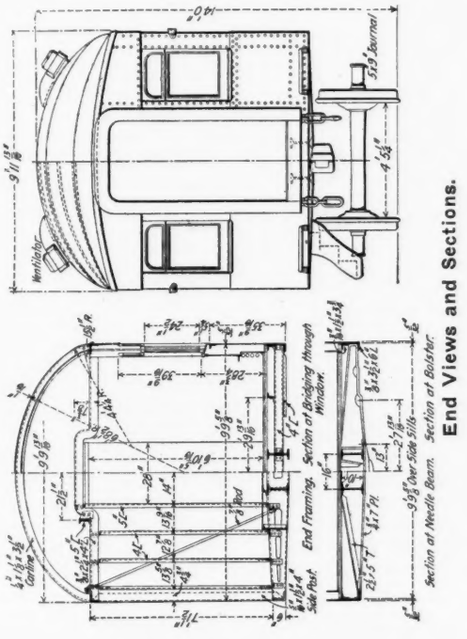
A consular report of June 3 says that money has been raised in London for the construction of a road from Puerto Wilches, on the Magdalena river, to Bucaramanga, capital of the Department of Santander, Colombia.

Final arrangements have been made for the extension of the government railroads in the state of Sao Paulo to the Bolivian frontier at Corumba. An agent has gone to Europe for materials and supplies, and work will commence at once on the Sao Paulo end. The extension is 1,100 kilometers long (683 miles), and it is expected to complete it in 2½ years. The entire work is to be done by the French syndicate which has been at work in the state of Sao Paulo for the past year.

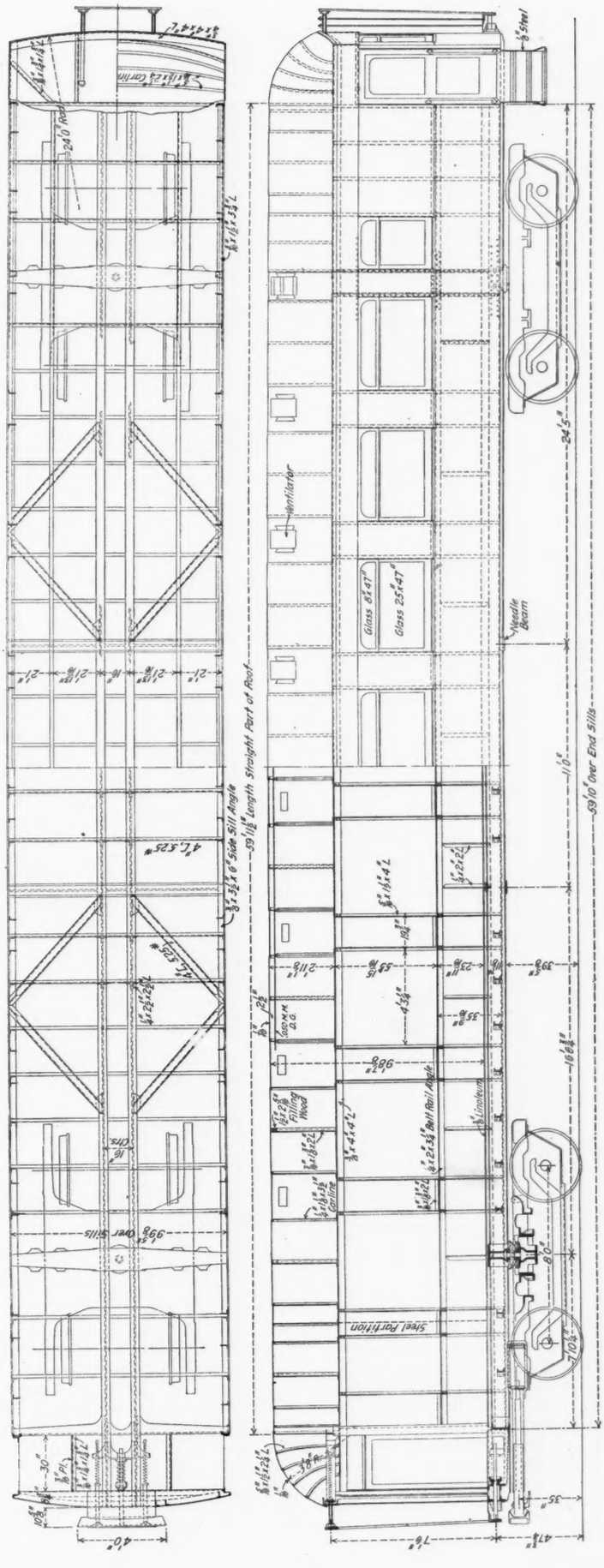
### New Design Standard Steel Coach; Southern Pacific.

The first all-steel coach of the Southern Pacific Company, which was built in 1906, was described in the *Railroad Gazette*, Oct. 5, 1906. This car weighed 107,000 lbs., the body weight being 75,000 lbs. and the trucks, which were the railroad company's standard four-wheel wood design with 36½ in. steel tired wheels, making up the remainder. Since the construction of this car the motive power department of the Southern Pacific has been at work on the plans with the double purpose of lessening the weight and of simplifying and improving the construction. The results have yielded a reduction in weight of 11,215 lbs., making the car of the present design weigh 95,785 lbs. All of this saving was accomplished in the body of the car, as the present trucks, although a different design, weigh approximately the same as the older ones and were not taken into account in the figures. The new truck is a recently-adopted four-wheel design, having an all-cast-steel frame and Schoen 36½ in. rolled steel wheels.

The most conspicuous single weight reduction was in the body bolsters. These were double cast steel. In the new design a single cast steel bolster is used, saving 3,390 lbs. in



End Views and Sections.



Common Standard Steel Passenger Coach; Southern Pacific.

weight. The side posts were changed from 4 in. x 2¼ in. x ⅜ in. angles to 4 in. x 1½ in. x 5/16 in. angles, saving another 1,000 lbs. The omission of truss rods and struts took off 900 lbs. more, and the reduction of the center sills from 12 in. 31.5 lb. I-beams to 10 in. 25 lb. I-beams yielded another 850 lbs. The inside finish was changed from mahogany to sheet steel, netting 800 lbs., and the substitution of cast steel for built-up end sills gave 750 lbs. The saving on all important details is shown in the following table, comparing the sample coach with the revised design:

| Details. | Sample coach. | Revised design. | Saving in w't. Approx. same.* |
|---|---|---|---|
| Trucks | Standard 4-whl. wood truck, 36½-in. steel tired wheels. | Cast-steel frames, 4-wheel truck, 36½-in. Schoen rolled st'l whls. | Lbs. |
| Center sills | 12-in. I-beams, 31.5 lbs. per ft. | 10-in. I-beams, 25 lbs. per ft. | 850 |
| Truss rods and struts. | (2) 1½-in. truss rods and malleable iron struts. | None | 900 |
| Side sills | 7 in. x 3½ in. x ½ in. | 6-in. x 3½-in. x ⅜-in. | 510 |
| Needle beams | ¼-in. plate with four (4) 3 in. x 3 in. x ¼-in. angles riveted together. | 5-in. T & 7¼-in. x ¾-in. plate. | 266 |
| Side sheets, outside (bel. windows). | 5/16-in. steel plate | 5/32-in. cold rolled pickled patent sheet steel. | ... |
| Side sheets, outside abv. belt rail. | 5/16-in. steel plate | 5/32-in. cold rolled pickled patent sheet steel. | 225 |
| Side plate angles | 4-in. x 4-in. x ½-in. | 4-in. x 4-in. x ⅜-in. | 400 |
| End frame posts | ¾-in. x 3-in. irn posts | 4-in. channels | 150 |
| Inside roof sheets | 1/16-in. steel sheets | 0.05 steel sheets | 250 |
| Vestibule doors frame angles. | 3-in. x 3-in. x ⅜-in. angles. | 3-in. x 3-in. x ¼-in. angles. | 144 |
| Side posts | 4-in. x 2¼-in. x ⅜-in. angles. | 4-in. x 1½-in. x 5/16-in. angles. | 1,000 |
| Body bolsters | Double cast steel | Single cast steel | 3,390 |
| End sills | ½-in. plates with 4-in. x 4 in. ½-in. angles riveted to top and bottom. | Cast steel | 750 |
| Belt rails | 4-in. x 2¼-in. x ⅜-in. angles. | 3-in. x 2-in. x ¼-in. angles. | 250 |
| Carlines | 3-in. x 2-in. x ¼-in. angles. | 3½-in. x 1-in. x ¼-in. angles. | 190 |
| Flooring | (2) 1/16-in. steel plates 1½-in. wood and ⅛-in. asbestos bet. plates; 5/16-in. "Battleship" linoleum for covering. | (2) corrug. steel plates, .36-in. & .05-in. thick, hair-felt bet. & monolith on top | ... |
| Seats | Scarritt standard | Hale & Kilburn fire proof steel frames. | ... |
| Draft gear | Miner | Sessions. | ... |
| Doors—all inside & outside. | Mahogany | Steel. | 100† |
| Inside finish | Mahogany. | Sheet steel. | 800 |
| Lighting system | 10 centre gas lamps, each with 4 electric bulbs. | 3 center gas lamps each with 4 electric bulbs & 16 electric side brackets. | 300 |
| Ceiling decoration. | ... | Changed to improve light effect & cheapen application. | ... |
| Basket racks | 4½ ft. woven wire | 5 ft. 2 in. solid bronze. | ... |

*Not considered. †Increased.

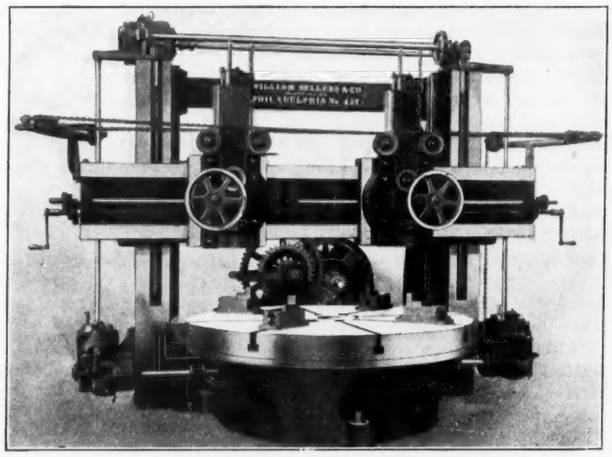
It will be noted that making all of the doors steel instead of mahogany increased the weight of this detail 100 lbs. In addition to the changes shown by the table there were numerous minor changes in details which saved 520 lbs. and simplified construction. In the recent conference at Chicago of the superintendents of motive power of the Harriman lines, further changes to lighten the weight were suggested. These were the elimination of the Frumveller heater, axle lighting device and storage batteries, which would save 4,200 lbs. These recommendations have not yet been approved. Possible lightening of the steel truck is also under consideration and other designs of steel trucks now in use are being studied to that end.

## Washington Union Station Ventilation.

The Washington Union passenger station is ventilated by 12 steel plate centrifugal fans which force into and draw from the various rooms 225,000 cu. ft. of air per minute. The main waiting room, the ticket lobby, the vestibules and the emigrants' waiting room are supplied with fresh air by two large fans having wheels 11 ft. in diameter and belt-driven by large motors. The air is exhausted by the 10 other fans, one having a wheel 6 ft. in diameter, four having wheels 4 ft. in diameter, two of 5 ft. diameter, two of 4 ft. 6 in. diameter, and one of 5 ft. 6 in. diameter. These exhaust the impure air from the emigrants waiting room, lunch rooms, main dining rooms, serving room, smoking room and lavatories. The heating coils contain 38,000 ft. of 1-in. pipe. Before entering these coils, the air is thoroughly cleansed in a screening device made up of large drums, 11 ft. in diameter and 14 ft. long. The screener is made of frames over which is stretched saturated burlap, which removes all grit, dust and soot from the air. The ventilating equipment was built and furnished by the American Blower Co., Detroit, Mich., and is an A B C standard. Wells & Newton, New York, installed the apparatus and built the air cleaning device.

## Boring and Turning Mill.

Manufacturers in America make more extensive use of boring and turning mills than the manufacturers of any other country, although this useful machine tool was first developed in England. In many shops this machine takes the place of a lathe because it is the more economical tool for many classes of work, owing to the facility with which the work can be set on the face plate. In some shops it is customary to place a number of pieces of small work on the surface of the table



Sellers Boring and Turning Mill.

around the edge, and thus turn almost a continuous ring. When the work permits, both tools on the cross-head may be made to cut at the same time, one on the top of the work and the other on the side.

To provide for the greatest output for a tool of this nature, it is necessary to provide the greatest convenience for all the movements, horizontally, vertically, engagement and disengagement of feeds, etc., so that the machine can be kept under cut as much of the time as possible. The time lost in preparing work reduces the output of a machine. The actual investment charge for the machine will, in many cases, be found to be a more important item than the labor charge, and hence every increase in production is a direct saving.

The boring mill shown in the illustration, built by Wm. Sellers & Co., Inc., Philadelphia, Pa., can take work 84 in. in diameter. The variable speed motor, supplied by the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has a speed range of 2½ to 1, giving the table any speed between 1 and 23.8 r.p.m., with the exception of two small gaps. The feed may be varied in eight steps, from 1/32 in. to ¾ in. per revolution of the table.

The machine is self-contained and not dependent on supplemental foundations for its rigidity, as the only portion of the machine extending below the floor line is the lever for adjusting the center step, which is accommodated by a trough 7 in. wide and 7 in. deep. The table has a flat bearing with a central spindle and adjustable step controlled by the lever mentioned above.

# GENERAL NEWS SECTION

## NOTES.

Passenger train No. 1 of the Chicago, Burlington & Quincy, scheduled from Chicago to Denver, 1,018 miles in 30 hours, has reached Denver on time for 90 days in succession. The average speed, including stops, is 33.9 miles an hour.

The Canadian Pacific has contracted with the Buffalo, Rochester & Pittsburgh, to buy from it a minimum of 225,000 tons of bituminous coal yearly for two years. It is agreed that a maximum of 300,000 tons per annum, if wanted, shall be supplied.

The St. Louis, Iron Mountain & Southern has been fined $100 on each of 12 indictments for failure to placard cars containing cattle from the Texas fever district. The same penalty was imposed on the St. Louis & San Francisco on three indictments for the same offense.

Representatives of the employees of the railroads in Nebraska recently appeared before the State Board of Railroad Commissioners and unitedly protested against further reductions in railroad rates in that state. The employees had previously, on April 7, met in Omaha and appointed a permanent committee of 15, composed of one member from each road, to appear before the commission.

The storms and floods of this month have seriously interfered with traffic on the railroads of the Southwest. The roundhouse of the St. Louis & San Francisco at Vernon, Tex., was destroyed by a cyclone on June 3, and at Tolbert, eight miles north of Vernon, over a mile of track of the Fort Worth & Denver City was washed out. Considerable damage was done at other places. This storm came just as the Texas roads had completed repairs of damages caused by the high water of early May.

The Attorney-General has begun proceedings for violations of the Safety Appliance Act against the Baltimore & Ohio, the Barre Railroad, the Chicago & Alton, the Chicago, Burlington & Quincy, the Cincinnati, Hamilton & Dayton, the Colorado & Southern, the Gulf, Colorado & Santa Fe, the Illinois Central, the Maryland Electric, the Montpelier & Wells River, the Northern Pacific, the Philadelphia & Reading, the Susquehanna & New York, the Toledo Railway & Terminal, and the Trinity & Brazos Valley.

The Arkansas supreme court has decided, in a case brought by the Chicago, Rock Island & Pacific, that the "full crew law" of that state is unconstitutional. The court said that the exemption from the provisions of the bill of roads less than 50 miles long was arbitrary and unjust; that the differences in the management of a trunk line and a small road might justify different applications of law, but there could be no difference between the operation of a line 49 miles long and one 51 miles long to justify the discrimination.

The Canadian Pacific has appointed an inspector, who will have his headquarters at Medicine Hat to superintend an extensive scheme of tree planting. Along both sides of the track, from Winnipeg to Vancouver, wherever convenient and desirable, the company will plan various kinds of trees, mostly pine, and every few years younger trees will be added to the plantation, which will be some 1,500 miles long. These trees are to be planted for a double purpose, to keep the track clear of snow, and to supply bridge timbers, telegraph poles, fence posts and ties.

At Waterbury, Conn., last Sunday, 75 delegates, said to represent ticket agents, station agents and other employees of the New York, New Haven & Hartford and the Boston & Maine, met and organized a division of "railroad station agents." A resolution was adopted "deprecating the adverse action that has been and is being directed against legitimate enterprise," and pledging the members to "enter the field of politics, in the municipality, state and national, with the end in view of securing the election to public office of those who are capable of viewing with justice and impartiality both sides of the industrial situation and not those unreasonably and fanatically inimical to our prosperity."

The Texas Railroad Commission has issued a statement which purports to show that the decrease in the gross earnings of the railroads of Texas for the nine months ended May 31, as compared with 1907, was $4,000,000. The decrease had been previously reported as about $8,000,000; but now it is declared that over half of the alleged decrease was fictitious, being due to the change in accounting methods required by the Interstate Commerce Commission, and it is said that earnings for the past nine months compared with the similar period two years ago show an increase of $2,500,000.

The suit of the government against the coal-carrying railroads under the commodities clause of the Interstate Commerce law was begun at Philadelphia, June 5, by the filing in the United States Court of bills in equity and petitions for an alternative writ of mandamus, which will be argued on June 16. Seven bills of equity and seven petitions for alternative writs of mandamus were filed against the Pennsylvania, the Reading, the Central of New Jersey, the Delaware, Lackawanna & Western, the Delaware & Hudson, the Erie and the Lehigh Valley. The complaints are substantially the same, the only differences being in the names of the companies, the designations of the properties they control and details as to the identity of certain directors in the controlling and subsidiary companies.

The report of earnings of the Interborough Rapid Transit Company, New York City, for the quarter ended March 31, reflects the increased business resulting from the opening of the subway extension to Brooklyn. This extension was opened early in January as far as Borough Hall. The gross earnings for the quarter show an increase equal to 5.34 per cent., and the net earnings an increase equal to 3.20 per cent. The elevated division showed a decrease of 3.60 per cent. in gross earnings and a decrease of 11.03 per cent. in net for the quarter. The increase in the gross earnings of the subway division, on the other hand, was 18.82 per cent., and in net earnings 25.30 per cent., the increase in expenses having been only 10.04 per cent. These figures bear out the prediction that because of the readjustment of traffic, the opening of the subway extension to Brooklyn meant a temporary loss to the Manhattan elevated division.

The Colorado Supreme Court has rendered a decision holding that the proceedings brought by the railroads to test the constitutionality of the railroad commission law, passed by the state legislature in 1907, were technically irregular, and has dismissed the suit. The railroads brought a quo warranto proceeding to remove the members of the railroad commission from office, on the ground that the law was unconstitutional; but the Supreme Court held that the real object of the suit was to have the act declared void in the interests of private property rights of railroad companies and that such an object could not be obtained through quo warranto proceedings. It is held that the judiciary does not have the power to restrain a state official or a state board from exercising governmental functions, whether legislative or executive, in advance of action by that official or board. No view was expressed in the majority opinion as to whether the law was constitutional. It is reported that the commission will at once resume its work, which was suspended during the litigation.

The Louisiana Railroad Commission has issued an order requiring the New Orleans & Northwestern to thoroughly repair its roadbed and put it in a safe and satisfactory condition. A complaint was filed with the commission on January 27 to the effect that the passenger service was unsatisfactory, and that the track was in a condition that made travel upon it dangerous. The commission states in its order that its investigation caused it to decide that "the roadbed and track of the New Orleans & Northwestern in Louisiana should be renovated and improved without delay." The commission

recognized, however, the fact that the St. Louis, Iron Mountain & Southern has done a large amount of work and expended a large amount of money on its line in Louisiana since the commission issued its order of January 10, 1907. The New Orleans & Northwestern is operated under the same management as the Iron Mountain, and in consideration of the work required by the commission to be done by the latter line, the New Orleans & Northwestern was granted until January 1, 1909, to do the work now required.

According to reports from St. Louis the Missouri Pacific and the St. Louis, Iron Mountain & Southern have announced that they will disregard the recommendations made by the Missouri State Board of Mediation and Arbitration, which recently recommended a basis of agreement between these roads and their striking car repair men. The board recommended that the roads should re-open their shops to their employees under the contract or agreement heretofore enforced; that the officers of the Brotherhood of Railway Car Men should call off the strike; that the members of the union should apply for their former positions and should be returned to work without prejudice as rapidly as conditions would permit; that the individual contracts now in effect for repair work to be done by private contractors in certain shops owned by the roads be terminated as speedily as possible; and that should the companies or the men desire to establish any rule or condition not provided for by the agreement heretofore governing, such change or modification should be put into effect without the intervention of any third party. The management of the Missouri Pacific is said to have stated that no contract with the employees had been violated by the company, as intimated by the report of the Board of Mediation.

The Wisconsin Railroad Commission act has been sustained by the Supreme Court of the state in the case of the Minneapolis, St. Paul & Sault Ste. Marie against the commission. The case grew out of the refusal of this road to stop its train at a dairy station called Dwight, in the extreme western part of the state. Dwight is between two towns about eight miles apart, and 350 dairy farmers desired to be relieved of the burden of hauling such great distances over rough roads. The railroad commission ordered the road to stop one train a day each way at Dwight, but the road appealed to the courts. The road claimed that the order made by the defendant commission was unreasonable and confiscatory; that the defendant had no power to issue the order, and that the making of the order was prohibited by an old statute enacted in 1874, providing that trains must stop at every town or village containing more than a certain number of inhabitants and a postoffice. The commission held that the needs of the town of Dwight justified an improvement of service, and that the old statute of 1874, so far as it applied to this case, had been abrogated by the new law of 1905 creating the railway commission. The decision of the Supreme Court says in part: "Railroads are not private corporations. They owe a duty to the state and to the public. The inhabitants of small communities who require service by railroads are as certainly entitled thereto as those living in larger communities. Reasonable service should be furnished smaller communities if it may be done without seriously interfering with the business at other points. * * *"

Joseph M. Brown, formerly one of the state railroad commissioners of Georgia, has been nominated for Governor of the state; and his victory at the primaries over Governor Hoke Smith, the present incumbent, seems to have been due to the conservative attitude taken by Mr. Brown, as compared with the radical position of Governor Smith—apparently an encouraging evidence of sanity among the voters of that state. Mr. Brown was removed from the office of railroad commissioner by Governor Smith, at the beginning of his administration, and a radical "friend of the people" was put in his place; but now the tables are turned, and it is said that Mr. Brown has won his victory while staying quietly at his home. He did not make a single speech. While Mr. Brown is little known personally, Governor Smith was well-known. So far as can be made out from the newspaper reports, the views of the two candidates on prohibition, and negro disfranchisement, and the other questions which were before the people were substantially the same; or at any rate were not sufficiently different to make an issue as between the two men; and this would seem to confirm the view that the business situation, which in this case means the railroad situation, was the paramount issue. Governor Smith was one of the leaders in the movement last year to force reductions in passenger rates throughout the southern states, and the same policy appears to have actuated him in all of his dealings with large corporations. Mr. McLendon, his appointee on the railroad commission as successor to Mr. Brown, vied with the most radical and irresponsible demagogues in his declamations against capital. Mr. Brown was on the railroad commission for several years, and is thoroughly informed on the relations of the railroads to the state.

## TRAFFIC NEWS.

The Louisiana Railroad Commission has issued a rule requiring the railroads to give 96 hours free time for the unloading of rice c. l. received at New Orleans.

Beginning on Friday of next week, the Mallory Line will run steamships direct between New York City and Mobile, Ala., calling at Tampa, Fla., and it is proposed within a month to have sailings each week.

The Pennsylvania Railroad has announced that on and after July 1 it will give stop-overs at Washington, D. C., on summer travel from Western points to New York. A rate of $12.50 from Pittsburgh to New York "with stopover at Washington" will be in effect July 1.

The Pend d'Oreille Navigation Co., which is connected with the Idaho & Washington Northern Railroad, has just put its first steamer in commission. It is a new boat, the "Ione," and it will run from Newport, Wash., to Ione, 110 miles, and will make connections with trains of the I. & W. N.

A committee, composed of representatives of the Wabash, the Cleveland, Cincinnati, Chicago & St. Louis, the Vandalia, the Toledo, St. Louis & Western and the Louisville & Nashville, has been appointed to study the drayage situation at St. Louis and report a plan for its final adjustment.

The Louisiana Railroad Commission has ordered the Louisiana & Arkansas, the Louisiana Railway & Navigation Company, Morgan's Louisiana & Texas Railroad and steamship company and other interested lines not to charge, after June 30, more than 40 cents per 100 lbs. for transporting sugar, rice and molasses, in less than carloads, from New Orleans to points on the Louisiana & Arkansas in Louisiana.

Merchants' rates to New York City will be effective from Trunk Line Territory August 15-19, and August 29 to September 2, with the usual fifteen day return limit. The rate for the round trip will be one fare and one-half, under the certificate plan. After July 1, 1908, no lower rate than a fare and a half will be granted by any of the railroads to any meeting or convention, irrespective of the size of the gathering.

Pending a decision by the interstate commission, the New York, New Haven & Hartford has notified the Central of New Jersey and its connections that all freight destined over those roads will be handled through Jersey City during this month as heretofore. It will be remembered that several months ago the New Haven canceled joint rates with these roads, giving notice that all freight would be routed by the Poughkeepsie Bridge route.

The Chesapeake & Ohio Railway Company, as a corporation; A. P. Gilbert, assistant general freight agent of the road, and W. R. Johnson, wholesale grain dealer, have been indicted by the federal grand jury at Richmond, Va., for violating the law in false billing. It is charged that grain was shipped from Richmond purporting to have come from the West when such was not the case. By the improper billing Johnson enjoyed an advantage of 3 cents per 100 lbs.

At the instance of the Rock Island-Frisco lines the railroads are checking over their interstate rates in Oklahoma with a view to making changes in them which will put certain classes of shippers in Oklahoma upon an equal basis with their competitors in adjacent states. The principal changes will be on grain, lumber, live stock and wheat. It is probable, in connection with this action, that the state government of Oklahoma will not push its proposed suit to dissolve the alleged

merger of the Chicago, Rock Island & Pacific and the St. Louis & San Francisco.

The Harriman roads have furnished for the Texas fruit and vegetable traffic this year no less than 3,000 refrigerator cars, and the express companies and private refrigerator lines are said to be much agitated over the matter. Fruit and truck shipments by the trainload are being hauled from east and south Texas to St. Louis, Chicago and Kansas City at rates less than the private lines can give. Texas fruit is going to northern markets on schedules from eight to 14 hours quicker than the fastest service ever before given.

The New Orleans tariff committee has passed a resolution which will undoubtedly result in an advance in rates on sugar, coffee, rice and molasses to be effective July 15. It will apply to the Central Freight Association territory and also to Illinois, Minnesota, Missouri, Nebraska and all west to the Rocky Mountains. The increase is a lining up of all rates in Chicago, Minneapolis, St. Paul and other territories to an equality with those to other points equally distant, and will amount to about 4 per cent.

The Interstate Commerce Commission has extended until July 1 the time for compliance with the order issued by it requiring a reduction in the terminal charge for delivering live stock to the Union Stock Yards at Chicago from $2 per car to $1. The railroads interested have filed a petition in the United States Circuit Court at St. Paul to restrain the enforcement of the order. Argument in the case has already been heard by Judges Sanborn, Hook and Adams. This case is especially interesting because it is the first that has been brought to restrain the enforcement of a rate order issued by the Commission under the revised Interstate Commerce law.

The New York, Chicago & St. Louis has filed with the Interstate Commerce Commission a tariff providing for a $10 second-class passenger rate between Chicago and New York. The Erie, it will be remembered, put into effect a $10 rate many months since, and the Wabash, and now the Nickel Plate, have adopted the same rate to meet the competition. The Baltimore & Ohio has given notice to the Interstate Commerce Commission and to the Central Passenger Association that it will as soon as legally permitted make a rate of $8 from Cincinnati to Baltimore and of $13.40 from St. Louis to Baltimore. These rates to be confined to steamship business if possible.

Reduced rates have been granted by the Central Passenger Association for the National Educational Association's annual convention at Cleveland; but so much time was used up in negotiations that when the details finally were arranged connecting roads had not time to prepare their tariffs and file them with the Interstate Commerce Commission 30 days prior to their going into effect. When the Alton applied to the commission for permission to make emergency rates, it was very reluctantly granted. The commission took occasion to read the association a lecture. Also it stipulated that "tariffs issued under the permission may not contain any condition that ticket holders shall pay any sum to the National Educational Association or its secretary." This prohibition prevents the association from making the roads its collecting agency of its $2 membership fee, which has been the practice for years.

The committee organized some months ago to prepare a uniform classification of freight for use throughout the United States has made its report and adjourned without day. It concluded (as indeed was inevitable) that it could not at present establish the desired uniformity. The changes would involve too violent a disturbance of long-established rates. But the committee did conclude that it would be feasible to unify (1) the rules relative to minimum weights, and (2) the descriptions of articles, in the Official, the Western and the Southern classifications, and recommended that such work be undertaken at once. It is this work that the working committee referred to in this column last week, and which is yet to be appointed, is expected to do. Prominent traffic officers believe that when this is accomplished most of the difficulties arising from differences in the classifications will have been overcome. The former committee was confident also, after exhaustive study of the subject, that unification in rates can be brought about in time, without violently affecting either commercial or railroad interests. It is expected that this phase of the subject will be taken up immediately after the preliminary work of harmonizing rules, etc., has been finished. In the meantime attention will be given to the necessary work in the revision of rate scales in the several territories preparatory to ultimate unification.

## INTERSTATE COMMERCE COMMISSION.

### Estimated Weights.

*Romona Oolitic Stone Co. v. Chicago, Indianapolis & Louisville. Opinion by Commissioner Lane.*

The decision of the Commission in a similar case was adhered to, and the carrier was ordered to stop showing purported weights upon its billing until such weights had been determined either by weighing or by some fair method of computation from cubic contents.

### Interstate Rates Within a State.

*Leonard v. Kansas City Southern and the Kansas City & Westport Belt. Opinion by Commissioner Prouty.*

Under the act to regulate commerce, as amended June 29, 1906, a carrier by railroad operating entirely within a state becomes subject to the provisions of the act if it engages in interstate transportation, although it has entered into no arrangement with any other carrier by railroad or water for the movement of traffic between points upon its line and points without the state. The movement of freight from a point in one state to a point in another state by rail must be regarded as an entirety, and every railroad participating in that movement thereby becomes subject to the act even though its service is performed entirely within a single state. Under the circumstances the Kansas City Southern should give to the complainant the benefit of the $3 switching charge which it absorbs when delivery is made to a connection for switching purposes within the switching limits of Kansas City, although in this case the delivery to the Belt Railway is without such switching limits.

### Limited Liability of Carriers.

*Informal decision in The Matter of Released Rates. Opinion by Commissioner Lane.*

Since the passage of the Hepburn Act the Commission has been in receipt of numerous requests for an administrative interpretation of that part of section 20 which deals with the liability of carriers. Before setting forth its position, the Commission deemed it advisable to hold an *ex parte* hearing in order to give carriers and shippers an opportunity to express their views. This hearing was held in Washington, D. C. Inasmuch as the Commission does not take jurisdiction over claims for damages to goods in transit, it must be recognized that this problem is essentially one for the courts. But the validity of so-called "Released Rates" is dependent upon its solution, and, if a definite statement of the Commission's position can meet with general acceptance, it will make for uniformity in railroad practice.

The conclusions of the Commission are as follows: If a rate is conditioned upon a shipper's assuming the risk of loss due to causes beyond the carrier's control, the condition is valid. If a rate is conditioned upon the shipper's assuming the entire risk of loss, the condition is void as against loss due to the carrier's negligence or other misconduct. If a rate is conditioned upon the shipper's agreeing that the carrier's liability shall not exceed a certain specified value, (a) the stipulation is valid when loss occurs through causes beyond the carrier's control; (b) the stipulation is valid, even when loss is due to the carrier's negligence if the shipper has himself declared the value, expressly or by implication, the carrier accepting the same in good faith as the real value, and the rate of freight being fixed in accordance therewith; (c) the stipulation is void as against loss due to the carrier's negligence or other misconduct if the specified amount does not purport to be an agreed valuation, but has been fixed arbitrarily by the carrier without reference to the real value; (d) the stipulation is void as against loss due to the car-

rier's negligence or other misconduct if the specified amount, while purporting to be an agreed valuation, is in fact purely fictitious and represents an attempt to limit the carrier's liability to an arbitrary amount. A carrier may lawfully establish a scale of charges applicable to a specific commodity and graduated reasonably according to value; but these rates must be applied in good faith, regard being had to the actual value of the property offered for shipment. A carrier must not make use of its released rates as a means of escaping liability for the consequences of its negligence, either wholly or in part.

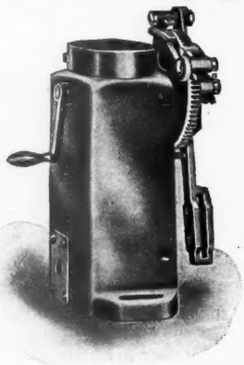
It is a mischievous practice for carriers to publish in their tariffs and on their bills of lading rules and regulations which are misleading, unreasonable or incapable of literal enforcement in a court of law; and a stipulation that an additional charge of 20 per cent. shall be collected on property that is shipped not subject to limited liability is unreasonable.

### Absorbing Tunnel Charges at Chicago.

The Wabash has announced the withdrawal, effective July 2, of the tariff filed by it with the Interstate Commerce Commission a few weeks ago, providing that it would absorb 6 cents per 100 pounds of the charge for transporting goods through the tunnels of the Illinois Tunnel Company at Chicago to the Wabash freight station. This tariff did not—as has been reported—provide for store door delivery. It specified that the tunnel charges would be absorbed on freight between the public stations of the Tunnel company and the station of the Wabash. All goods under this arrangement had to be hauled by team to the Tunnel company's stations. The first notice that the tunnel charges would be absorbed was given some time ago by one of the other eastern roads. The announcement was subsequently withdrawn, but too late to prevent the filing of the Wabash's tariff with the Interstate Commerce Commission. The matter of absorbing tunnel charges at Chicago and all related matters, such as the absorption of lighterage on the Chicago river, switching in "trap" cars, the status of a certain large industry having a private freight station on one of the surface roads, etc., will be taken up by the interested lines and an attempt made to determine to what extent the Chicago lines shall absorb switching and similar charges. The Wabash contends that in absorbing tunnel charges it was only doing substantially what other lines at Chicago are doing in other ways.

### Oil Pump for Steam Hammers.

An oil pump especially adapted to steam hammer service is shown in the accompanying illustration. It is designed on the no-valve principle, and the absence of valves, springs and stuffing boxes enables it to withstand the shocks and jars of hammer service, and pump oil into the steam satisfactorily. In this pump the plunger is also the valve. The upstroke of the plunger draws in a charge of oil. An eccentric which acts at the end of the upstroke so turns the plunger as to close the inlet and open the outlet to the feed pipe. At the lower end of the stroke the eccentric again acts to return the plunger to the first position.



Madison-Kipp Oil Pump.

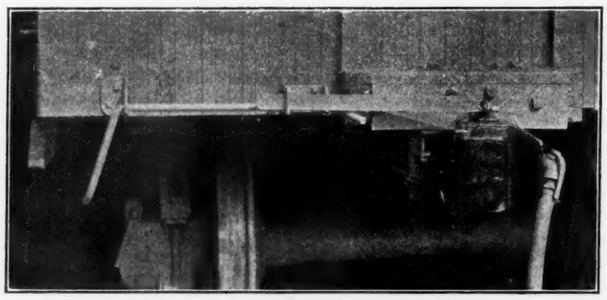
It is claimed that the pump will deliver thick or thin oils against any pressure, and will measure and pump them accurately; also that it minimizes the oil bill and hammer repairs. One of these pumps has been in service on a hammer continuously for four years and has cost nothing for repairs; it apparently is still good for indefinite service. The pumps are strongly and simply made. The Madison-Kipp Lubricator Co., Madison, Wis., is the maker.

### Opening of Railroad to Ceiba, Honduras.

The railroad from Salado, Honduras, to Ceiba, 35 miles, was opened for regular traffic April 11. The track is 3-ft. gage laid with 40-lb. rails on creosoted ties with good ballast.

### A New Uncoupling Device.

An uncoupling device invented by C. A. Schroyer, Superintendent Car Department, Chicago & North-Western, which is being applied to North-Western cars, is shown in the accompanying illustrations. When used with a coupler having a lockset and knuckle-throwing device, the bracket near the



Schroyer Uncoupling Device; Coupler Locked.

corner of the car is of the form here shown. On the old-style couplers, lacking the features mentioned, this bracket is made with an angle shelf on which the uncoupling bar slides, holding the locking block in the upward position and allowing the coupler to be pulled open in the separation of the cars. When the cars are coupled again and the knuckle is forced backward into position, the rod is released from the shelf automatically

Schroyer Uncoupling Device; Coupler Unlocked.

and drops to normal position. The device thus works automatically for both the old and the new style couplers.

All parts of the device come below, or about level with, the top of the locking block, so that it may be applied to all equipment. On flat cars it will not be interfered with by the shifting of the load or in the use of the cars in gravel service.

### Sterlingworth Railway Supply Company.

The Supreme Court of Pennsylvania for the Eastern District recently tried the appealed case of Frank W. Coolbaugh, President of the Sterlingworth Railway Supply Company, Easton, Pa., vs. Asher W. Herman. The Court of Common Pleas of Northampton County had decided in a quo warranto that Mr. Herman was entitled to hold the office of director of the Sterlingworth company. The Supreme Court reverses this. The decision is, in part, as follows: At the annual election held January 22, 1907, certain shares of stock standing on the books in the name of "William J. Kuebler, Trustee," and "Howard P. Kinsey, Trustee," and "Zearfoss & Hilliard, Trustees," were voted by the parties named as trustees in favor of the defendant (Mr. Herman) as a director. It was claimed by relator that these votes were illegal. This was conceded by defendant if objection thereto at the election was made in time. It was admitted on the trial that during the election objection to the contested votes was made and a statement under oath furnished to the election officers as required by the Act of May 26, 1893, P. L. 141; but the testimony was conflicting as to whether this was done at the time the ballots were tendered, or later. . . . This case seems to have

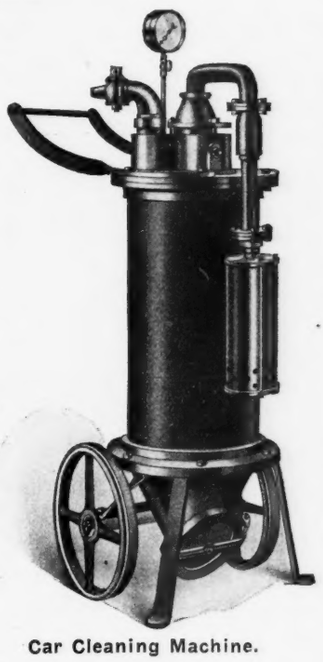
been tried upon the theory that the election board did not act upon the protest which was filed and that it was not required to do so if the protest was not filed substantially at or about the time when the ballots were tendered. But it appears from the evidence that the election board did take action upon the protest and that they determined to accept the votes as offered. . . . Under the facts of the case at bar, no difficulty appeared in identifying the ballots to which objection in writing was made, at the time when the election board were considering the protests. The Act of 1893 was passed to further define evidence of stock ownership and the right to vote thereon. Under its provisions, if the person in whose name the stock stands and who is offering to vote thereon, either in person or by proxy, is not the owner thereof either in his own right or as active trustee, with the character of his trusteeship disclosed on the face of the certificate or transfer books in connection with his name, he is not entitled to vote the stock. Clearly, therefore, it was the duty of the election judges to reject the votes offered in the name of an undisclosed trust. Obviously, in so far as the stock and the voting of which objection in this case was made, was concerned, the character of the trusteeship was not disclosed and the votes so tendered should have been rejected. The plain intention of the statute is to prevent voting by an inactive trustee, or in behalf of an undisclosed trust. It cannot be said that such a requirement is destroying any property right. It is merely regulating the exercise of the right. If the trust be not active the right to vote the stock is expressly reserved to the real owner by the second section of the Act. . . .

### Seeing One's Railroad Thoroughly.

W. F. Jackson, General Manager of the North British Railway, has walked over every yard of the North British system, which now comprises a total of 1,163 miles owned, leased and rented.

### Car Cleaning Machine.

The accompanying cut shows a No. 3 truck of a car cleaning device which is used in connection with the combined compressed air-vacuum system of the General Compressed Air & Vacuum Machine Co., St. Louis, Mo. This device is designed to clean coaches, sleeping cars, interurban and street cars. An automatic control valve shuts off the flow of air at any desired vacuum when the cleaning tubes are not in operation. After blowing the cinders and dust out of ventilators and crevices with compressed air, the hose is attached to the vacuum pump and the car is cleaned by suction. The truck here shown, No. 3, can be used in cleaning yards the tracks of which are too close together for the use of the No. 1 truck, which is carried on a large carriage.



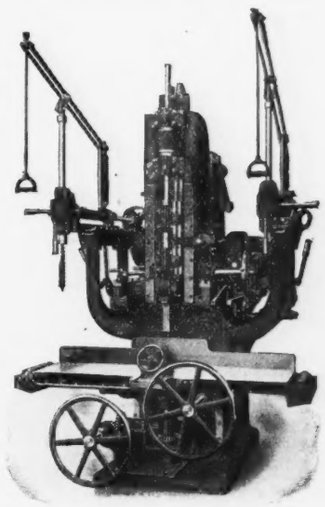
Car Cleaning Machine.

### Disastrous Collision in Maryland.

Near Annapolis, Md., on the evening of June 5, a butting collision of electric cars on the Washington, Baltimore & Annapolis resulted in the complete wrecking of both cars and the killing of eight persons—five passengers, the motorman and two employees of the company riding as passengers. One of the killed was the three-year-old daughter of Mr. Slaughter, General Traffic Manager of the company, and Mr. Slaughter himself was seriously injured. The newspaper accounts say that there was confusion of orders as to the point where the two cars were to meet. Both cars were running extra.

### Car Mortiser for Heavy Work

The latest design of car mortiser of J. A. Fay & Egan Co., Cincinnati, O., is shown in the accompanying illustration. It is intended for heavy work in both car and bridge construction, and is made with one, two or no auxiliary boring attachments. It has a capacity for mortises from ½ in. to 3 in. square, and up to 6 in. deep, or, by reversing timbers, 12 in. deep. The frame is a single-cored casting with wide base of great weight. The housing is securely gibbed to the frame, with provision for taking up wear. It moves transversely on frictionless rollers by a hand wheel, and can be locked in any position desired. The chisel ram is gibbed to the housing and has a vertical travel of 18 in. The auger spindle is driven at the proper speed by a belt with a take-up, so that the strain is constant, regardless of the position of the housing. The reciprocating motion of the chisel ram is produced by a pinion in a rack operated by friction pulleys, giving a constant and positive drive. The table is made either stationary or traveling. The stationary table is 6 ft. 6½ in. long and is provided with stop to regulate the length of mortise. It is moved by hand wheel, rack and pinion, and can be raised and lowered by hand. The traveling table is made any length desired. It is made of steel I-beams, has automatic feed under instant control of the operator, and is provided with adjustable stops for regulating the distances between mortises. The countershaft is self-contained in the base of the machine, convenient for direct-connected motor drive.



Fay & Egan Car Mortiser.

The auxiliary boring attachments angle 30 deg. in either direction. The two spindles have a vertical stroke of 18 in. and a lateral adjustment of 18 in., and are driven by independent countershafts, having tight and loose pulleys.

### Rosenberg Generator Train Lighting.

A trial car on the Austria-Hungary State Railroads recently made several trips equipped with the Rosenberg generator train lighting system. The car had six compartments, each lighted with two koloid-tungsten lamps of 16 Hefner c.p. There were five more 16 c.p. lamps in the corridor. These lamps used 32 volts, while the generator is designed for a 44 to 58-volt current of 30 amperes. The storage battery can supply current for all the lamps for six consecutive hours. To prevent dimming of the light when changed from generator to battery, iron resistance boxes of the cartridge type are connected in series to the lamps and mounted in the corridor so as to be accessible in case of trouble. The field rheostat, by which the current is controlled while charging the battery, and also the automatic reverse current relay, which prevents back current from the storage battery to the generator while the train is slowing down, are also in the corridor. In the trials, the lights were steady and did not flicker when starting or stopping. It is understood that the Belgian government recently made extensive trials of Osram lamps for train lighting and that they proved satisfactory both as to amount of light and low current consumption.

## Report of Revenues and Expenses of Railroads for Month of April, 1908.

| Name of road. | Mileage operated at end of month. | Operating revenues: Revenue, Freight. | Revenue, Passenger. | All other revenue from transportation. | Revenue, operations other than transportation. | Total operat'g revenues. | Operating expenses: Maintenance, Way and structures. | Maintenance, Of equipment. | Expenses, Traffic. | Expenses, Transportation. | Expenses, General. | Total operating expenses. | Net operating revenues (or deficit). | Taxes. | Operating income (or loss). |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atchison, Topeka & Santa Fe | 7,100 | $4,256,098 | $1,433,788 | $644,489 | $54,069* | $6,280,306 | $774,528 | $829,274 | $127,144 | $1,684,915 | $106,600 | $3,522,461 | $2,757,845 | $271,951 | $2,485,894 |
| Baltimore & Ohio | 4,006 | 3,743,478 | 950,974 | 291,362 | 38,971 | 5,024,785 | 760,523 | 936,516 | 125,202 | 2,002,902 | 95,082 | 3,920,226 | 1,104,559 | 158,591 | 945,968 |
| Bangor & Aroostook | 515 | 175,740 | 47,063 | 6,622 | 8,497 | 237,922 | 26,491 | 18,106 | 2,745 | 73,138 | 8,666 | 129,146 | 108,776 | 1,000 | 107,776 |
| Buffalo, Rochester & Pittsburgh | 568 | 353,967 | 68,052 | 9,213 | 1,027 | 432,259 | 38,529 | 92,963 | 7,671 | 162,759 | 11,337 | 313,259 | 119,000 | 15,000 | 104,000 |
| Central Vermont | 536 | 184,941 | 70,416 | 21,556 | 2,204 | 279,117 | 25,919 | 31,766 | 7,572 | 125,916 | 8,130 | 199,303 | 79,814 | 8,585· | 71,229 |
| Chicago, Indianapolis & Louisville | 617 | 264,138 | 105,629 | 32,477 | 2,536 | 404,780 | 62,999 | 67,681 | 12,592 | 153,052 | 12,529 | 308,853 | 95,927 | 21,500 | 74,427 |
| Chicago, Lake Shore & Eastern | 580 | 286,944 | ..... | 19,768 | 5,634 | 312,346 | 25,731 | 67,703 | 971 | 90,416 | 4,366 | 189,187 | 123,154 | 3,000 | 120,159 |
| Chicago, Rock Island & Pacific | 7,402 | 2,605,099 | 1,097,910 | 246,603 | 40,614 | 3,990,226 | 591,336 | 541,914 | 112,467 | 1,736,925 | 104,205 | 3,086,847 | 903,379 | 157,070 | 746,309 |
| Cleveland, Cincinnati, Chic. & St. L. | 1,983 | 1,055,791 | 466,283 | 169,057 | 17,526 | 1,708,657 | 243,472 | 260,059 | 61,284 | 811,868 | 38,642 | 1,415,325 | 293,332 | 51,531 | 241,801 |
| Denver & Rio Grande | 2,501 | 1,004,687 | 363,238 | 59,195 | 5,652 | 1,432,772 | 172,599 | 231,999 | 33,762 | 484,329 | 37,186 | 959,875 | 472,897 | 61,000 | 411,897 |
| Erie | 1,899 | 2,273,608 | 641,457 | 195,350 | 2,609 | 3,113,024 | 315,725 | 637,880 | 72,201 | 1,195,823 | 65,917 | 2,287,546 | 825,478 | 95,715 | 729,763 |
| Florida East Coast | 584 | 212,845 | 106,608 | 70,515 | 4,707 | 394,675 | 42,806 | 48,084 | 5,806 | 108,148 | 10,609 | 215,453 | 179,222 | 12,847 | 166,375 |
| Great Northern | 6,663 | 2,433,483 | 797,441 | 225,828 | 26,729 | 3,483,481 | 604,234 | 526,605 | 67,651 | 1,141,472 | 63,967 | 2,403,929 | 1,079,552 | 175,404 | 904,148 |
| Gulf, Colorado & Santa Fe | 1,515 | 500,439 | 166,841 | 44,681 | 3,366 | 715,327 | 110,645 | 150,772 | 21,165 | 380,101 | 23,760 | 686,444 | 28,883 | 34,439 | †5,556 |
| Houston & Texas Central | 789 | 252,552 | 110,792 | 4,190 | 3,673 | 371,207 | 52,100 | 40,277 | 13,585 | 190,526 | 17,778 | 314,266 | 56,941 | 18,000 | 38,941 |
| Iowa Central | 558 | 181,563 | 33,432 | 9,681 | 729 | 225,405 | 48,134 | 24,939 | 7,659 | 102,528 | 8,424 | 191,684 | 33,721 | 7,354 | 26,367 |
| Lake Erie & Western | 724 | 238,636 | 49,755 | 16,051 | 1,750 | 306,192 | 90,647 | 55,323 | 11,088 | 145,112 | 11,500 | 313,670 | 7,478‡ | 17,000 | †24,478 |
| Lehigh Valley | 1,452 | 2,557,625 | 263,887 | 66,310 | 15,696 | 2,903,518 | 283,014 | 371,920 | 61,755 | 860,214 | 42,100 | 1,619,003 | 1,284,515 | 94,300 | 1,190,215 |
| Michigan Central | 1,746 | 1,325,792 | 445,880 | 164,614 | 13,080 | 1,949,366 | 203,578 | 223,769 | 53,980 | 821,412 | 35,694 | 1,338,434 | 610,932 | 90,000 | 520,932 |
| Minneapolis & St. Louis | 1,028 | 182,350 | 67,644 | 18,996 | 1,072 | 270,062 | 67,067 | 40,696 | 9,304 | 126,744 | 9,035 | 252,846 | 17,216 | 12,772 | 4,444 |
| Minn., St. Paul & Sault Ste. Marie | 2,310 | 552,482 | 187,497 | 54,736 | 17,731 | 812,446 | 108,704 | 102,986 | 18,152 | 301,760 | 16,250 | 547,852 | 264,594 | 48,747 | 215,847 |
| Nashville, Chattanooga & St. Louis | 1,230 | 572,078 | 187,427 | 36,109 | 5,830 | 801,444 | 124,718 | 123,183 | 34,182 | 320,629 | 20,300 | 623,012 | 178,432 | 18,355 | 160,077 |
| New York Central & Hudson River | 3,588 | 3,733,493 | 1,966,737 | 638,626 | 62,078 | 6,400,934 | 865,762 | 837,595 | 152,357 | 2,753,843 | 133,115 | 4,742,672 | 1,658,262 | 312,435 | 1,345,827 |
| New York, Chicago & St. Louis | 553 | 631,446 | 90,127 | 20,414 | 1,792 | 743,779 | 45,977 | 106,188 | 45,516 | 316,275 | 12,593 | 526,549 | 217,230 | 23,000 | 194,230 |
| Norfolk & Western | 1,877 | 1,681,698 | 242,470 | 64,550 | 5,330 | 1,994,048 | 219,764 | 270,147 | 38,304 | 645,739 | 43,605 | 1,217,559 | 776,489 | 87,600 | 688,889 |
| Northern Central | 460 | 737,047 | 150,698 | 43,669 | 5,426 | 936,840 | 102,006 | 161,504 | 14,664 | 421,168 | 18,839 | 718,181 | 218,659 | 19,515 | 199,144 |
| Oregon R. R. & Navigation Co | 1,264 | 819,096 | 271,612 | 49,614 | 5,880 | 1,146,202 | 119,309 | 80,038 | 12,953 | 394,745 | 26,452 | 633,497 | 512,705 | 46,765 | 465,940 |
| Oregon Short Line | 1,451 | 1,026,223 | 308,907 | 60,493 | 11,017 | 1,406,640 | 150,136 | 90,490 | 13,256 | 266,306 | 23,046 | 543,234 | 863,406 | 48,083 | 815,323 |
| Pere Marquette | 2,362 | 768,919 | 219,224 | 72,184 | 8,222 | 1,068,549 | 119,633 | 224,073 | 30,808 | 491,883 | 28,382 | 894,785 | 173,764 | 52,173 | 121,591 |
| St. Louis & San Francisco | 4,727 | 1,587,642 | 578,772 | 195,115 | 17,311 | 2,378,840 | 267,822 | 178,562 | 64,481 | 907,637 | 78,424 | 1,496,926 | 881,914 | 91,548 | 790,366 |
| St. Louis Southwestern | 773 | 353,668 | 74,549 | 21,761 | 2,456 | 452,434 | 65,271 | 67,321 | 18,989 | 136,873 | 19,842 | 308,296 | 144,138 | 20,816 | 123,322 |
| St. Louis Southwestern of Texas | 697 | 136,533 | 50,947 | 14,743 | 2,233 | 204,456 | 76,553 | 46,896 | 7,224 | 134,742 | 13,298 | 278,713 | 74,257‡ | 9,166 | †83,423 |
| San Antonio & Aransas Pass | 724 | 173,317 | 54,788 | 12,806 | 2,082 | 242,993 | 43,186 | 20,015 | 3,671 | 103,265 | 10,170 | 180,307 | 62,686 | 10,700 | 51,986 |
| Union Pacific | 3,095 | 2,324,729 | 671,734 | 263,511 | 16,916 | 3,276,890 | 388,075 | 291,161 | 71,783 | 841,659 | 78,077 | 1,670,755 | 1,606,135 | 105,363 | 1,500,772 |

## Report of Revenues and Expenses of Railroads for Ten Months of Fiscal Year 1908.

| Name of road. | Mileage operated at end of period. | Operating revenues: Revenue, Freight. | Revenue, Passenger. | All other revenue from transportation. | Revenue, operations other than transportation. | Total operat'g revenues. | Operating expenses: Maintenance, Way and structures. | Maintenance, Of equipment. | Expenses, Traffic. | Expenses, Transportation. | Expenses, General. | Total operating expenses. | Net operating revenues (or deficit). | Taxes. | Operating income (or loss). |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atchison, Topeka & Santa Fe | 7,100 | $ 3,997,109 | $15,024,602 | $4,836,026 | $639,589 | $64,497,326 | $9,835,572 | $10,750,118 | $1,251,826 | $19,035,951 | $1,075,251 | $41,948,718 | $22,548,608 | $2,092,478 | $20,456,130 |
| Baltimore & Ohio | 4,006 | 7,864,124 | 11,676,443 | 3,060,662 | 478,807 | 63,080,036 | 9,150,678 | 10,965,724 | 1,395,230 | 23,688,131 | 1,050,206 | 46,249,969 | 16,830,067 | 1,644,980 | 15,185,087 |
| Bangor & Aroostook | 515 | 1,602,012 | 513,420 | 67,217 | 264,711 | 2,447,360 | 423,762 | 217,516 | 29,660 | 843,356 | 90,157 | 1,604,451 | 842,909 | 14,500 | 828,409 |
| Buffalo, Rochester & Pittsburgh | 568 | 5,513,120 | 800,129 | 106,938 | 13,549 | 6,433,736 | 851,051 | 1,322,214 | 80,301 | 2,086,706 | 118,806 | 4,459,078 | 1,974,658 | 150,000 | 1,824,658 |
| Central Vermont | 536 | 1,954,485 | 929,561 | 217,006 | 29,185 | 3,130,237 | 431,158 | 524,460 | 75,584 | 1,436,779 | 74,707 | 2,542,688 | 587,549 | 94,316 | 493,233 |
| Chicago, Indianapolis & Louisville | 617 | 2,867,429 | 1,103,183 | 349,532 | 28,888 | 4,349,032 | 698,161 | 668,348 | 115,429 | 1,525,052 | 120,208 | 3,127,198 | 1,221,834 | 215,000 | 1,006,834 |
| Chicago, Lake Shore & Eastern | 580 | 3,318,767 | ..... | 294,357 | 83,917 | 3,697,041 | 320,750 | 982,925 | 11,771 | 1,155,963 | 49,590 | 2,520,999 | 1,176,042 | 38,821 | 1,137,221 |
| Chicago, Rock Island & Pacific | 7,402 | 30,669,983 | 13,288,438 | 2,576,477 | 305,242 | 46,840,140 | 6,479,830 | 6,615,695 | 1,180,765 | 18,901,633 | 1,056,971 | 34,234,894 | 12,605,246 | 1,392,433 | 11,212,813 |
| Cleveland, Cincinnati, Chic. & St. L. | 1,983 | 13,226,298 | 5,697,049 | 1,900,650 | 187,294 | 21,011,291 | 2,740,508 | 3,459,486 | 716,664 | 8,868,216 | 393,668 | 16,178,542 | 4,832,749 | 649,989 | 4,182,760 |
| Denver & Rio Grande | 2,501 | 12,230,362 | 4,338,064 | 678,222 | 76,595 | 17,323,243 | 1,893,924 | 2,741,682 | 374,268 | 5,781,766 | 397,010 | 11,188,650 | 6,134,593 | 625,000 | 5,509,593 |
| Erie | 1,899 | 25,906,731 | 7,269,622 | 2,213,623 | 216,995 | 35,606,971 | 4,434,871 | 7,970,776 | 781,588 | 13,432,381 | 693,936 | 27,313,552 | 8,293,419 | 943,783 | 7,349,636 |
| Florida East Coast | 584 | 1,060,659 | 937,866 | 403,972 | 57,508 | 2,460,005 | 487,246 | 383,003 | 74,770 | 906,729 | 82,256 | 1,934,004 | 526,001 | 105,497 | 420,504 |
| Great Northern | 6,663 | 5,302,509 | 9,407,786 | 2,212,694 | 170,155 | 47,093,144 | 7,625,588 | 6,986,246 | 624,690 | 14,496,795 | 610,095 | 30,343,414 | 16,749,730 | 1,984,792 | 14,764,938 |
| Gulf, Colorado & Santa Fe | 1,515 | 6,961,767 | 2,217,936 | 497,576 | 67,426 | 9,744,705 | 1,560,671 | 1,824,576 | 211,208 | 4,403,374 | 261,636 | 8,261,465 | 1,483,240 | 296,480 | 1,186,760 |
| Houston & Texas Central | 789 | 3,474,419 | 1,478,358 | 49,381 | 46,907 | 5,049,065 | 696,739 | 660,411 | 142,141 | 2,032,398 | 185,625 | 3,717,314 | 1,331,751 | 174,977 | 1,156,774 |
| Iowa Central | 558 | 2,057,458 | 404,391 | 106,578 | 10,864 | 2,579,291 | 289,966 | 265,715 | 84,963 | 1,026,074 | 79,157 | 1,745,875 | 833,416 | 72,168 | 761,248 |
| Lake Erie & Western | 724 | 2,860,250 | 616,891 | 196,607 | 28,562 | 3,702,310 | 531,818 | 711,498 | 107,978 | 1,528,438 | 108,562 | 2,988,293 | 714,017 | 165,181 | 548,836 |
| Lehigh Valley | 1,452 | 24,989,282 | 3,494,587 | 737,669 | 239,829 | 29,461,368 | 3,091,443 | 5,235,543 | 657,738 | 9,619,040 | 482,733 | 19,086,498 | 10,374,870 | 943,000 | 9,431,870 |
| Michigan Central | 1,746 | 14,606,552 | 5,242,503 | 1,878,951 | 154,414 | 21,882,420 | 2,662,099 | 2,762,526 | 655,762 | 8,785,745 | 363,788 | 15,229,921 | 6,652,499 | 878,775 | 5,773,724 |
| Minneapolis & St. Louis | 1,028 | 2,209,602 | 841,392 | 208,296 | 20,042 | 3,279,333 | 349,504 | 421,535 | 91,850 | 1,227,677 | 98,770 | 2,189,336 | 1,089,997 | 161,606 | 928,391 |
| Minn., St. Paul & Sault Ste. Marie | 2,310 | 6,813,501 | 2,260,790 | 579,665 | 198,392 | 9,852,348 | 1,087,906 | 1,155,326 | 190,214 | 3,532,064 | 164,759 | 6,130,269 | 3,722,079 | 597,457 | 3,124,622 |
| Nashville, Chattanooga & St. Louis | 1,230 | 6,525,779 | 2,079,272 | 486,452 | 66,651 | 9,158,154 | 1,294,696 | 1,717,587 | 335,330 | 3,414,037 | 223,257 | 6,984,907 | 2,173,247 | 210,465 | 1,962,782 |
| New York Central & Hudson River | 3,588 | 43,338,938 | 22,974,314 | 6,457,480 | 749,419 | 73,520,151 | 10,288,052 | 11,346,076 | 1,806,552 | 31,090,440 | 1,405,807 | 55,936,927 | 17,583,224 | 2,791,986 | 14,791,238 |
| New York, Chicago & St. Louis | 553 | 6,749,553 | 1,282,465 | 266,021 | 25,788 | 8,323,827 | 640,327 | 997,011 | 437,499 | 3,366,442 | 126,776 | 5,568,055 | 2,755,772 | 257,579 | 2,498,193 |
| Norfolk & Western | 1,877 | 20,514,813 | 3,447,827 | 759,083 | 81,060 | 24,802,783 | 2,984,076 | 4,123,895 | 395,985 | 8,060,743 | 493,224 | 16,057,923 | 8,744,860 | 845,600 | 7,899,260 |
| Northern Central | 460 | 8,100,140 | 1,761,586 | 479,737 | 87,169 | 10,428,632 | 1,137,742 | 2,148,252 | 134,810 | 4,697,234 | 190,062 | 8,308,101 | 2,120,531 | 195,146 | 1,925,385 |
| Oregon R. R. & Navigation Co | 1,264 | 8,169,880 | 2,950,202 | 531,607 | 76,585 | 11,728,274 | 1,443,698 | 1,641,785 | 158,305 | 2,887,179 | 275,039 | 6,060,573 | 5,667,701 | 326,201 | 5,341,500 |
| Oregon Short Line | 1,451 | 9,523,686 | 3,173,464 | 651,424 | 143,569 | 13,492,143 | 1,575,093 | 2,237,722 | 160,195 | 3,192,717 | 294,032 | 6,537,311 | 6,954,832 | 494,962 | 6,459,870 |
| Pere Marquette | 2,362 | 8,008,820 | 2,810,327 | 739,918 | 100,441 | 11,659,506 | 1,393,361 | 2,122,038 | 247,463 | 5,203,806 | 255,807 | 9,338,159 | 2,321,347 | 448,544 | 1,872,803 |
| St. Louis & San Francisco | 4,727 | 19,690,076 | 7,295,386 | 2,161,192 | 184,484 | 29,331,138 | 3,802,077 | 4,122,038 | 656,063 | 10,928,653 | 837,834 | 20,346,665 | 8,984,473 | 706,324 | 8,278,149 |
| St. Louis Southwestern | 773 | 4,239,882 | 907,685 | 208,942 | 29,128 | 5,385,637 | 671,416 | 785,312 | 204,155 | 1,425,311 | 181,667 | 3,267,861 | 2,117,776 | 151,530 | 1,966,246 |
| St. Louis Southwestern of Texas | 697 | 1,916,558 | 721,143 | 163,306 | 24,822 | 2,825,829 | 789,614 | 556,314 | 87,115 | 1,395,907 | 136,450 | 2,965,400 | 139,571‡ | 91,809 | †231,380 |
| San Antonio & Aransas Pass | 724 | 1,787,834 | 684,714 | 142,972 | 19,004 | 2,634,524 | 442,831 | 282,898 | 40,663 | 993,534 | 91,206 | 1,851,132 | 783,392 | 107,100 | 676,292 |
| Union Pacific | 3,095 | 27,097,730 | 7,474,617 | 2,679,045 | 183,996 | 37,435,388 | 4,772,986 | 4,879,963 | 806,436 | 10,469,670 | 992,640 | 21,921,695 | 15,513,693 | 1,197,847 | 14,315,846 |

* Debit. † Loss. ‡ Deficit.

### Uniform Demurrage and Storage Rules of South-Eastern Railways.

A meeting of officers of the railroads south of the Ohio and Potomac rivers and east of the Mississippi river, and of representatives of the car service associations in this territory, was held at the Piedmont Hotel, Atlanta, Ga., on May 26, for the discussion of uniform demurrage and storage rules. Forty-seven railroads, 10 car service (demurrage) associations and the car efficiency committee of the American Railway Association were represented at the meeting. The result of the conference was a decision to recommend to all the railroads and car service associations in the territory referred to the adoption of demurrage and storage rules substantially the same as those recommended by the American Railway Association. The object of the meeting was explained by T. E. Brooks, of the Louisville & Nashville, who was chairman, and by J. S. B. Thompson, of the Augusta Southern Railway. J. C. Haskell, Georgia, Florida & Alabama, was secretary. Changes in and additions to the rules recommended by the American Railway Association were made as follows:

Rule 1, Cars Subject to Rules.—(B). Stricken out. (C). Made to read as follows: "Private cars on tracks of the owner or on privately owned tracks of the consignor or consignee, when used for the transportation of commodities which the owners of the cars produce or in which they deal." (G). Made to read as follows: "Empty cars held by railroads for prospective loading, or empty private cars held on private tracks for prospective loading, provided such cars have not been ordered placed for loading."

M. J. C. Wrenne (N., C. & St. L.), gave notice that his line would enforce Rule 1 as to "cars loaded with coal at mines or mine sidings, held for billing or forwarding directions."

Rule 2, Free Time Allowed.—The following paragraph (F) was adopted: "Freight in bond will be allowed 48 hours (two days) free time for removal, after permit to receive goods is issued to consignees by United States Collector of Customs." Mr. Wrenne (N., C. & St. L.) gave notice that his line would allow 48 hours for reconsignment.

Rule 3, Computing Time.—Paragraph B was made to read as follows: "Time will be computed from the first 7 a.m. after notice to consignee of arrival, when cars are held for orders, or from the first 7 a.m. after notice and placing on public delivery tracks, when cars are held for unloading."

Rule 5, Placing Cars for Unloading.—The second sentence of paragraph A was so changed as to provide that "the agents must give written notice for all cars which they have been unable to deliver because of the condition of the private tracks, or because of other conditions attributable to consignee.

Rule 6, Cars for Loading.—The second sentence of paragraph A was changed to provide that when cars are held on orders of the consignor, "the agent must give written notice of all cars which he has been unable to place because of the condition of the private track or because of other conditions attributable to this consignor." The following paragraph C was added: "When empty cars, placed for loading on orders, are not used, demurrage will be charged from the first 7 a.m. after placing or tender until released, with no time allowance."

Rule 7, Inability of Switching Lines to Receive.—The words, "owing to the inability of the consignee to receive" are stricken out.

Rule 9, Claims.—This rule as recommended was made to read as follows: "When demurrage charges accrue under these rules from causes named below, such charges shall be canceled or refunded: Causes.—(A) when the condition of the weather during the time prescribed for loading or unloading cars or removal of freight is such as to render it impossible to release cars or remove freight without serious damage to the freight, or when shipments are frozen so as to prevent unloading. (B) delayed or improper notice by carrier. (C) errors or omissions by the delivering road.

Storage rules were then taken up and unanimously recommended as follows:

Rule 1, Freight Subject to Storage Charges.—All freight received for delivery, or held for forwarding instructions, if stored in or on carriers' freight stations, platforms or yard space, is subject to storage regulations as hereinafter stated.

Rule 2, Rates for Storage.—Section 1. All less than carload freight, not removed from the custody of the carriers within 48 hours, computed as in Rule No. 3, will thereafter be subject to a charge for storage each day or fraction of a day that such consignment may remain in the custody of the carrier of 1 per cent. per 100 lbs. per day, with a minimum charge of 5 cents for any one package or lot, for one consignee; provided, that in no case shall the amount so collected for storage or a L.C.L. shipment exceed the amount authorized to be charged as storage or demurrage on a carload of similar freight for the same length of time. Sec. 2. For storage of C.L. freight 10 cents per ton of 2,000 lbs. per day, or fraction thereof, but not exceeding $1 per day on any consignment not in excess of a carload.

Rule 3, How Time Is Computed.—Section 1. In computing time, Sundays and legal holidays are excluded. Sec. 2. The time allowed for removing freight before storage charges apply is computed from the first 7 a.m. following notice of arrival. Prompt notice shall be given by agents to consignees of the arrival of all freight.

Rule 4, Collections.—Freight upon which storage charges have accrued under these rules shall not be removed from the railroad company's premises until such charges have been adjusted.

Rule 5, Claims.—When storage charges accrue under these rules from causes named below, such charges shall be canceled or refunded: Causes.—(A) when the condition of the weather during the time prescribed for removal of freight is such as to render it impossible to remove freight without serious damage to same. (B) delayed or improper notice by carrier. (C) errors or omissions by the delivering railroad.

On motion it was recommended that the proposed demurrage and storage rules be made effective on September 1, 1908, and that proper publication and filing be made at such a date as to insure that all lines would make them effective September 1. The question of the best mode of securing uniformity in the interpretation of the rules was then taken up and the following resolution was adopted:

Resolved, That the Car Service Managers of the lines adopting uniform rules recommended this day shall form an association for the purpose of defining and construing the above rules and practice thereunder, and that they shall select a committee of three from their number, which shall pass upon any questions upon which they are not unanimous. It was recommended that each Car Service (Demurrage) Manager in the territory covered by the uniform rules as recommended shall immediately, on receipt of these proceedings, place the subject before the lines of his association, with the request that they act upon it as early as possible, and that the Car Service Manager shall report such action as soon as practicable to the secretary of this meeting, in order that all lines may be advised of the final action taken.

The demurrage associations which were represented at the conference and to which the railroads represented belong to, are the following: Virginia Car Service Association, North Carolina Car Service Association, Alabama Car Service Association, East Tennessee Car Service Association, Nashville Car Service Association, Memphis Car Service Association, Southeastern Car Service Association, Louisville Car Service and Storage Department, Missouri Valley Car Service Association, Southern Car Service Association.

### Final Decision on a Bearing Metal Patent.

On June 1 the United States Supreme Court denied the petition of the Ajax Metal Company for a writ of certiorari to review the decision in favor of the Brady Brass Company by the United States Court of Appeals. This decision was to the effect that the Ajax patent on which infringement was claimed is invalid. It was fully summarized in the *Railroad Gazette*, March 6, 1908, page 326. The following statement, by counsel in this case, seems to make the situation clear:

"The decision of the United States Circuit Court of Appeals in cases involving the validity of a patent is by statute made final, and no appeal therefrom is permissible to the United States Supreme Court. The statute does, however, give the right to a defeated party in such cases to apply to the United States Supreme Court for a writ of certiorari to review the decision of the Circuit Court of Appeals. The Ajax Company availed themselves of this right and made such an application to the United States Supreme Court. That application was denied on June 1, and this decision finally settles the rights of the parties."

### The Iron Situation.

Rogers, Brown & Co., New York, received reports last week from their various offices, as follows:

Cincinnati—An increased inquiry for extended period and sales footing up a tonnage of excellent proportions is the week's record. All this, in connection with a firming up in prices and the actual withdrawal from the market of some furnace interests, mark the last few days as the brightest and best witnessed by the iron trade in months.

Philadelphia—The improvement in the market which manifested itself last week has continued, and inquiry this week is even broader than a week ago. There are now pending negotiations for upward of 25,000 tons of foundry iron in this market, a good deal of which will result in business.

Cleveland—The past week has shown an active market in pig iron with many inquiries for prices for last half delivery and considerable tonnage of both northern and southern grades.

Buffalo—From the point of view of the blast furnace, the feature of the present market is the very heavy volume of tonnage under consideration. Actual orders already placed are much beyond expectations also.

Pittsburgh—A much better feeling prevails this week over any period for months past in the iron market. A decided buying movement has set in. Sales of pig iron are being made for spot, June and July deliveries, and for large tonnages.

Birmingham—A turn for the better in the pig iron market has been evidenced this past week by a great many inquiries and quite a number of sales. It has been estimated that more pig iron was sold last week alone than during any month since last October.—*Wall Street Journal.*

## SUPPLY TRADE NOTES.

G. E. Ellis, Signal Engineer of the Chicago, Rock Island & Pacific, has gone to the Federal Signal Co., Albany, N. Y., as Manager of Installation.

The R. D. Nuttall Co., Pittsburgh, Pa., has added to its line of gears and pinions the Titan steel gears and pinions, having arranged with the Atha Steel Casting Co., Newark, N. J., for their exclusive sale.

The Chapman Company announce the location of its offices at 1537 Marquette building, Chicago. It is prepared to undertake the design and construction of public service and industrial properties, complete.

The Standard Roller Bearing Co., Philadelphia, Pa., has installed at its factory a testing laboratory, in charge of Walter H. Hart, a chemist formerly connected with the Alan Wood Iron & Steel Co., Philadelphia.

Forsyth Brothers Company, Chicago, has opened a New York office in the Hudson Terminal buildings, 50 Church street, in charge of A. L. Whipple, Sales Manager, formerly with the Curtain Supply Co., Chicago.

The H. W. Johns-Manville Co., New York, has established a branch office at 30 South Pennsylvania street, Indianapolis, Ind., in charge of Charles E. Wehr, who has for several years represented the company in that section.

The Twin City Equipment Co., Minneapolis, Minn., has established an office at 318 Hyde Park building, Spokane, Wash. C. W. Bickford, who was for a number of years a contractor's superintendent, has been appointed Western Manager.

The Acme Railway Equipment Co., Philadelphia, Pa., reports the shipment of 1,000 sets of Acme universal uncoupling devices to the Laconia Car Co. for use on 1,000 Boston & Maine gondola cars; also shipments of 300 sets each to the American Car & Foundry Co. and the Cambria Steel Co. for 600 cars being built for the Lehigh & New England.

Joseph T. Ryerson & Son, Chicago, have moved to new general offices and warehouses at Sixteenth and Rockwell streets. The offices at Milwaukee avenue and Lake street have been discontinued, but branch offices will be maintained at the Commercial National Bank building. There will be an hourly automobile service between the general and branch offices.

Edwards & Zook, Consulting and Civil Engineers, 50 Church street, New York, have completed the physical and real estate valuation of the New York, New Haven & Hartford for John F. Stevens, and are now prepared to engage in railroad surveys, location, construction, reconstruction, examinations, estimates, valuations, reports and superintendence.

W. J. A. London has been appointed Chief Engineer of the Terry Steam Turbine Company, Hartford, Conn., succeeding Mr. C. E. Terry, recently deceased. Mr. London's experience in turbine building began with his connection with the C. A. Parsons Co., Newcastle, England. About 15 years later he was with Brown-Boveri Co., Baden, Germany, and later with the British and the American Westinghouse companies.

A consular report says that another opportunity is to be offered to submit automatic car couplers to the Italian government. There were 200 entries at the Milan exposition last year, but all the devices were unsatisfactory, and the proposed premium was not awarded. This is the reason that a new exhibit is proposed. The date has not yet been set. The officer in charge is Engineer Cav. Ambrogio Campiglio, and his address is Via San Giovanni sul Muro, 25, Milan, Italy.

J. R. McColl, formerly Associate Professor of Steam Engineering at Purdue University, and now connected with the engineering department of the American Blower Co., Detroit, Mich., has been delivering a series of lectures before engineering classes of the technical schools in the middle west. The subjects dealt with are the movement and heating of air for heating, ventilating and drying systems; the theory and practice of blower design and installation, and kindred topics. The lectures are illustrated by stereopticon views and are followed by discussions by the students.

The Anchor Packing Co., Philadelphia, Pa., was formed last year by former officers of the Garlock Packing Co., Palmyra, N. Y. Recently several members of the Philadelphia sales force of the Garlock company also went to the new company, whose officers now include: President, L. H. Martell, formerly manager of the Ellwood City metal packing factory; Vice-President, E. F. James, Pennsylvania State Senator; Secretary, L. E. Goggin, formerly Purchasing Agent of the Garlock company; General Manager, L. E. Adams, formerly General Sales Manager of the Garlock company. C. W. Hadcock will be at Chicago; J. F. Edmonds at Pittsburgh, Pa.; E. C. Adams at Detroit, Mich., and W. R. Haggart at Philadelphia.

## TRADE PUBLICATIONS.

*Steel Lath.*—A post card, 11 by 7 in., calls attention to the Herringbone fireproof steel lath manufactured by the General Fireproofing Co., Youngstown, Ohio.

*Rail Anchors.*—Bulletin T-238 describes Paine's vise-grip rail anchor sold by the Railway Specialty & Supply Co., Chicago. Also a supplement to T-1,607 giving some data on the P. & M. rail anchor.

*Chicago, Burlington & Quincy.*—A folder describes a Colorado Yellowstone tour with appropriate views from the Yellowstone. Another folder more fully illustrates and describes the Yellowstone Park, hotel service, coaching tours, etc.

*Car Cleaners.*—Bulletin No. 60, of the General Compressed Air & Vacuum Machinery Co., St. Louis, Mo., describes trucks Nos. 1, 2 and 3, for use in cleaning cars. The system is described in another column of this issue of the *Railroad Age Gazette.*

*Threading Machinery.*—The Foote-Burt Co., Cleveland, Ohio, has just issued a catalogue on the Reliance bolt, pipe and nut tapping machines and accessories. Die heads, single, double and triple machines for all sizes of standard threads, and also for threading staybolts, are illustrated and described. These machines are built for either belt or motor drive.

*Denver & Rio Grande.*—A Glimpse of Utah, Its Resources, Attractions and Natural Wonders by Edward F. Colburn has been issued by the passenger department. The object of the book is to give wider publicity to the development and achievements of Utah and to stimulate inquiry by capitalists and home seekers about the opportunities in that state. It is handsomely illustrated and instructively descriptive.

*Motors.*—Bulletin No. 4,588 of the General Electric Co., Schenectady, N. Y., gives a full description of the GE-202 railway motor. This motor is similar in design and construction to the standard GE railway motors, but is provided with commutating poles. The motor is especially adapted for operation on heavy grades, or in cars which are geared for high-speed work, but have to start and stop frequently. The bulletin contains several illustrations, dimension diagrams, characteristic curves and a service data sheet for use in ordering.

*Rails and Equipment.*—The W. A. Zelnicker Supply Co., St. Louis, Mo., in its circular of May 26, gives a list of rails and

equipment for sale. It includes rails from 8 lbs. to 80 lbs.; standard gage locomotives from 9 tons to 89 tons, all types; standard gage geared locomotives from 15 tons to 175 tons; 36-in. gage locomotives, some of them geared, ranging from 8 tons to 37 tons. The list also includes both freight and passenger cars, steam shovels, traction and hoisting engines and other smaller engineering supplies.

*Tungsten Economy Diffusers; Lightning Arrester.*—Under the name Tungsten economy diffuser the General Electric Co., Schenectady, N. Y., is placing on the market a new form of illuminating device. Bulletin No. 4,594 describes and illustrates two types of this diffuser designated respectively as the store type and mill type. They consist of a broad reflector or diffuser surrounding a frosted globe containing the lamps. The bulletin contains photometric curves showing the light distribution under different combinations, connections and data as to the different styles manufactured. Bulletin No. 4,595 describes the Form I aluminum lightning arrester which is now being placed on the market. A view showing a cross section of the arrester in its durable steel tank is given. Illustrations of arresters for different capacities, diagrams of dimensions and connections and other data are given which is of interest to the managements of electrical installations.

## MEETINGS AND ANNOUNCEMENTS.

### Railroad Commissioners' Chicago Conference.

The conference of railroad commissions to be held in Chicago on June 12, as heretofore announced, was called by the Michigan Railroad Commission, and Louis C. Crampton, Secretary of that Commission, writes as follows regarding it: "This conference will be largely informal in nature, the primary purpose being to bring about a better understanding and closer relations between the several commissions who are to a large extent dealing with the same roads and confronted by the same problems. Among subjects which will be discussed will be the apportionment of accounts as between states, the proposed general increase in freight rates, prevention of accidents, application of the two-cent rate to interstate fares, interchange of business between electric and steam roads and rules governing operation of interurban roads. No definite programme has been arranged. It is quite possible that no formal action will be taken on any matter."

### Altoona Railroad Club.

This club, which was started last month, is different from the ordinary railroad club in that attendance at the meetings is compulsory. That is to say, every member—all are officers or high class employees of the Pennsylvania Railroad—is expected to ask leave of his superior officer if he wishes to stay away from any meeting. This is explained by the fact that the club has been started under the auspices of the railroad company which, as all the world knows, is everything in Altoona. The President of the club is G. W. Creighton, General Superintendent of the Eastern Pennsylvania Grand division of the road. The notice, which was sent out at the organization of the club, says that its object is to bring the men in the different departments into closer business and social relations, with a view to improving the service by broadening the individual. The first meeting was held on April 15 at the Altoona Cricket Club. The membership consists of the officers of the road resident in Altoona, with a few outside that city, and the chief clerks, draftsmen, inspectors and other employees intimately associated with the officers.

### Association of Car Lighting Engineers.

An association having the above name was formed at a meeting held in Ogden, Utah, on May 20 and 21. The object of the association is to further the interests of car lighting, particularly electric car lighting, and to try to bring about the use of standards on interchanged equipment on the railroads of the United States and Canada. Meetings will be held once a year, or oftener, for the discussion of subjects pertaining to train lighting.

All men directly or indirectly in charge of electric car lighting on any road in the United States or Canada are eligible for active membership. All men who have been engaged in electric car lighting work for a period of over one year on any railroad in the United States or Canada, on recommendation of their superior officer, are eligible for associate membership, also representatives of railroad supply companies.

At the first meeting there was a general discussion of train lighting matters and the president was instructed to assign to members subjects for papers to be discussed at the next meeting. The officers are: President, A. J. Farrely, Electrical Engineer, Chicago & Northwestern; First Vice-President, E. M. Cutter, Signal Supervisor, Southern Pacific; Second Vice-President, A. J. Collett, Electrical Engineer, Union Pacific; Secretary and Treasurer, G. B. Colgrove, Chief Electrician, Illinois Central; Executive Committee, H. C. Malloy, Chief Electrician, Lake Shore & Michigan Southern; O. W. Ott, Chief Draftsman, Oregon Short Line; G. W. Murray, Chief Electrician, San Pedro, Los Angeles & Salt Lake; C. W. Terry, Chief Electrician, Minneapolis, St. Paul & Sault Ste. Marie. The next meeting will be held in Chicago some time in October.

### Local Freight Agents' Associations.

The twenty-first annual convention of the American Association of Local Freight Agents' Associations is to be held at Toledo, June 16, 17, 18 and 19. At the opening session on Tuesday evening it is expected that addresses will be given by M. E. Ingalls, Chairman of the Board of Directors of the Cleveland, Cincinnati, Chicago & St. Louis; by Arthur Hale, General Superintendent of Transportation of the Baltimore & Ohio and Chairman of the American Railway Association Committee on Car Efficiency; by Major D. W. Dunn, Chief Inspector of the Bureau for Safe Transportation of Explosives; W. L. Ross, General Traffic Manager of the Toledo, St. Louis & Western, and C. H. Newton, Freight Claim Agent of the Wabash. Among the subjects for discussion laid down in the programme are the following:

Is it practicable to adopt a uniform credit system on all railroads? From each city it is reported that there is no uniformity in the practice of the different railroads.

Advantages to be derived from the use of typewriting and other machines. There is much difference in opinion as to the practicability and profit of machine work in local freight offices.

Marking L. C. L. shipments billed to order, or order notify. The rule requiring full name and destination on each package does not fully provide for shipments of this kind.

How much work is saved in local freight offices by interline billing?

Proper packing. The use of straw board packages in place of wooden ones is increasing, and much heavy machinery is received not properly skidded.

A special committee will make a report on uniform blanks for local freight station use.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Belt Railway of Chicago.*—See Chicago & Western Indiana.

*Chicago & Western Indiana.*—Benjamin Thomas, President and General Manager of this road and of the Belt Railway of Chicago, has resigned. W. J. Henley, Vice-President and General Solicitor, temporarily succeeds Mr. Thomas as President, and J. B. Warren, General Superintendent, succeeds Mr. Thomas as General Manager. E. P. Ripley, formerly Director of both of these roads, was re-elected only to the Board of the Belt company.

*Chicago, Rock Island & Pacific.*—Theodore Brent, chief clerk to the Vice-President and Traffic Manager of the St. Louis & San Francisco, has been appointed Assistant to W. B. Biddle, Third Vice-President of the Chicago, Rock Island & Pacific and the St. Louis & San Francisco.

*Isthmian Canal Commission.*—Lieutenant-Colonel Hodges, of the Corps of Engineers, U. S. Army, and General Purchasing Officer of the commission, has been appointed a member of the commission, succeeding Jackson Smith, resigned.

*St. Louis & San Francisco.*—See Chicago, Rock Island & Pacific.

### Operating Officers.

*Chicago, Burlington & Quincy.*—J. P. Cummings, Superintendent at Kansas City, Mo., has been appointed Superintendent of the Beardstown division, with office at Beardstown, Ill., succeeding P. H. Hough. M. H. Young has been appointed Superintendent of Terminals at St. Louis, Mo., succeeding F. L. Johnson.

*Chicago Great Western.*—See Mexican Central.

*Indianapolis Southern.*—F. B. Harriman, General Manager, has been appointed General Superintendent, succeeding C. L. Ewing. J. G. Rawn, Vice-President, has assumed the duties of General Manager, succeeding Mr. Harriman.

*Mexican Central.*—E. E. Serrine has been appointed Superintendent of the Monterey division, with office at Monterey, Nuevo Leon, succeeding Charles Stich, resigned. G. W. Vanderslice, Superintendent of Terminals at El Paso, Tex., and Ciudad Juarez, Chih., Mex., has been appointed Superintendent of the Chihuahua division, with office at Chihuahua, Chih., succeeding W. T. Provence, resigned. L. S. Bourne, Train Master at Clarion, Iowa, on the Chicago Great Western, succeeds Mr. Vanderslice.

*Southern Pacific.*—H. W. Crawford has been appointed Superintendent of Terminals of the Southern Pacific at Galveston, Texas.

*Texarkana & Fort Smith.*—G. P. Williams has been appointed Superintendent of Terminals at Port Arthur, succeeding E. E. Gibson.

### Traffic Officers.

*Canadian Pacific.*—B. W. Greer, General Freight Agent of the Pacific division, with headquarters at Vancouver, B. C., has resigned to take over the management of the Johnson Wharf Co., Vancouver, B. C.

The office of W. B. Bulling, Assistant Freight Traffic Manager, Eastern Lines, has been moved from Toronto, Ont., to Montreal, Que.

*Erie Despâtch.*—W. R. Crow has been appointed General Manager, with office at Chicago, succeeding H. S. Stebbins, resigned.

*Houston & Texas Central.*—T. J. Anderson has been appointed General Passenger Agent, with office at Houston, Texas, succeeding M. L. Robbins, resigned.

*Lake Erie & Western.*—Samuel B. Sweet, General Freight Agent, has been appointed General Agent, Freight Department, effective June 15.

*Philadelphia & Reading.*—W. H. McCormick, District Passenger Agent at Philadelphia, Pa., has been appointed Assistant General Passenger Agent, with office at Philadelphia.

*St. Louis Southwestern.*—James Allen, chief clerk to J. L. West, Assistant General Freight Agent of the Missouri, Kansas & Texas, has been appointed General Freight Agent of the St. Louis Southwestern, succeeding R. C. Fife, resigned.

*Seaboard Air Line.*—E. E. Wood has been appointed New England Freight Agent, with office at 360 Washington street, Boston, Mass., succeeding Edwin Butler, resigned.

### Engineering and Rolling Stock Officers.

*Canadian Northern.*—G. W. Hedge has been appointed Assistant Master Mechanic, at Winnipeg, Man., succeeding G. S. McKinnon, resigned.

*Lehigh Valley.*—R. G. Kenly, General Superintendent of the Lehigh & New England, has been appointed Engineer of Maintenance of Way of the Lehigh Valley, with office at South Bethlehem, Pa., succeeding E. B. Ashby, who was recently made Chief Engineer.

*Monongahela Connecting.*—The *Railway Age* in its issue of May 29 erroneously stated that O. G. Ferguson, Superintendent of Transportation, had been appointed also Master Car Builder, succeeding H. W. Watts, deceased. The statement should have been that Mr. Ferguson had been appointed Superintendent of Car Service, succeeding Mr. Watts. F. M. McNulty, Master Mechanic, has been appointed Superintendent of Motive Power and Rolling Stock, and will also perform the duties of Master Car Builder.

### Purchasing Agents.

*Missouri, Oklahoma & Gulf.*—E. B. Fischer, General Superintendent, has been appointed also Purchasing Agent, succeeding G. H. Bacon.

## CAR BUILDING.

*The Illinois Valley (Electric)* has ordered six trailers from the Danville Car Co.

*The Sterling, Dixon & Eastern Electric*, Sterling, Ill., is in the market for four closed cars.

*The Oklahoma-El Reno Interurban Traction*, Kansas City, Mo., wants addresses of manufacturers of electric cars.

*The New York, New Haven & Hartford* has ordered 10 all-steel passenger cars from the Standard Steel Car Co. It is believed, but not yet confirmed, that 90 more will be ordered.

*The Colorado & Southern* has ordered from its Denver, Colo., shops, 100 narrow gage cars. The trucks and body bolsters for this equipment will be built by the Bettendorf Axle Co.

*The Washington Railway & Electric*, as mentioned in the *Railroad Age Gazette* of June 5, has ordered 15 interurban cars from the J. G. Brill Co., but will not be in the market soon for 30 standard type cars.

*The Chicago & Milwaukee Electric*, Chicago, placed an order over a year ago for 20 passenger cars to be built by the Jewett Car Company. Ten of them were built but owing to a change in design work on the rest was held up until the present time. It is understood that plans are now being completed and that the construction of this equipment will be begun at an early date.

*The Panama Railroad* recently asked new bids for the 300 30-ton box cars, specifications of which were published in the *Railroad Gazette* of February 21. The lowest revised bid was from the Standard Steel Car Co. The bid was $1,077 per car, complete, erected at Cristobal. The American Car & Foundry Co. made the second lowest bid, $1,091 per car erected. The Standard Steel Car Co. bid was also the lowest when bids were previously asked on this equipment.

*The Temiskaming & Northern Ontario* has ordered 50 steel underframe box cars of 80,000 lbs. capacity from the Dominion Car & Foundry Co. These cars will be 36 ft. long, 8 ft. 6 in. wide and 7 ft. 10¾ in. high, inside dimensions, and 13 ft. 3 in. high, over all. The special equipment includes:

| | |
|---|---|
| Bolsters | Simplex |
| Brakes | Westinghouse |
| Brake-beams | Simplex |
| Brake-shoes | Steel back |
| Couplers | Tower, with Acme device |
| Draft gear | Miner tandem |
| Dust guards | Harrison |
| Journal bearings | Canadian Bronze Co. |
| Roofs | Winslow galvanized corrugated iron inside |
| Side bearings | Susemihl |

## IRON AND STEEL.

The Detroit United has ordered 800 tons of standard rails from the Pennsylvania Steel Co.

The Pennsylvania Steel Co. has a contract for 1,500 tons of fabricated steel for the Pennsylvania's viaduct near Sunnyside, L. I.

The Oklahoma-El Reno Interurban Traction Co., Kansas City, Mo., wants to get in touch with manufacturers of steel rails.

It is said that the Hamburg-American Packet Co. will soon place a contract for a new steel pier at Hoboken, and that about 1,500 tons of steel will be required.

The Chicago, Milwaukee & St. Paul has ordered 600 tons of bridge girders, half to be built by the Wisconsin Bridge & Iron Co. and half by the Minneapolis Steel & Machinery Co.

A meeting of steel manufacturers was held in New York on June 9, and price reductions were agreed on for the leading iron and steel products, except rails. E. H. Gary, of the United States Steel Corporation, who acted as chairman, announced the result as follows: "The representatives of the leading steel manufacturing companies have been in session during the day. It is understood that the price of iron ore has been, or will soon be, reduced 50 cents per ton base. Each one of

the steel manufacturers expressed the opinion that there should be a readjustment in the prices of their respective commodities as follows: Billets, from $28 per ton to $25 per ton, Pittsburgh; sheet bars, from $29 per ton to $27 per ton, Pittsburgh; plates, from $1.70 per 100 lbs. to $1.60 per 100 lbs., Pittsburgh; structural iron, from $1.70 per 100 lbs. to $1.60 per 100 lbs., Pittsburgh; merchant pipe, a reduction of two points, or $4, per ton, Pittsburgh; wire nails, from $2.05 per 100 lbs. to $1.95 per 100 lbs. Sheet and tin plates were reduced early in the year, therefore no changes were considered in the prices of these products. It is hoped that these changes will not necessitate a general or radical readjustment of wages, which it is desired to avoid."

## RAILROAD STRUCTURES.

CHICAGO, ILL.—The Chicago & North-Western will build for the sanitary district of Chicago 742 ft. of dock on the west side of the Chicago river, south of Fifteenth street. This improvement is made necessary by an agreement for the exchange of properties.

FORT WORTH, TEXAS.—The St. Louis Southwestern, it is said, will spend over $500,000 in building terminals and a freight shed here. (Aug. 1, p. 137.)

SAN DIEGO, CAL.—The common council of San Diego has granted to the San Diego & Arizona wharfage franchises covering an area from Ninth street to Sixteenth street. Three piers, accommodating two tracks each, will be built as soon as contracts can be let. The total dock frontage aggregates 7,888 ft.

SUPERIOR, WIS.—Plans have been made by the Wisconsin Central for a new passenger station between John and Ogden streets. The building will be of brick 165 ft. x 40 ft., one-story high. A brick freight house 170 ft. x 30 ft. will also be built.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

ATLANTA & CAROLINA.—This company is said to have filed a mortgage to secure $6,000,000 5 per cent. 30-year bonds to build its proposed line from Atlanta, Ga., to Augusta, about 200 miles. The route is via College Park, Conyers, Walnut Grove, Jersey, Monroe, High Shoals, Watkinsville, Affins, Crawford, Lexington and Washington. James W. English, President; M. T. Edgerton, Secretary; Matthew Mason, Chief Engineer, all of Atlanta.

BLYTHEVILLE, LEACHVILLE, ARKANSAS SOUTHWESTERN.—Capitalized at $250,000 to build 50 miles of line from Blytheville, Ark., connecting with Leachville and with Latour. L. C. Lange, W. J. Orr, J. R. Hancock, of Blytheville; R. L. McClelland, Western Springs, Ill., and William Wilms, Chicago, are Directors.

BOSTON & ALBANY.—See New York Central & Hudson River.

CANADIAN NORTHERN.—A press despatch from Winnipeg, Ont., states that the Dominion government has decided to help the Canadian Northern to complete its line to Hudson Bay by giving it a cash bonus of $800,000 a mile and guaranteeing a portion of the bonds of the road from the present terminus, The Pas, Keewatin, to Fort Churchill on Hudson bay, 480 miles. In return the government is to control rates and secure trackage rights for other railroads over the line. The road is to be completed in two years.

CANADIAN PACIFIC.—An officer of the Esquimalt & Nanaimo writes that contracts have been let for clearing the right of way on the extension from Wellington, B. C., west to Albernie, 58 miles. The contract for grading the first section, 12 miles, has been let to John B. Bright, Vancouver, B. C. A branch is projected north from French creek to Comox, 60 miles. The work will be heavy and about 20 miles will be through rock.

It is announced that the line from Toronto, Ont., north to Sudbury, 254 miles, is to be opened for traffic June 15. Through train service is to be established between Toronto and Winnipeg.

CHESAPEAKE & OHIO.—It is said that the Rinehart & Dennis Co. are to resume work on the contract at Scary, W. Va. It is also said that this road has ordered resumption of work on the Potts Creek Railroad. (Oct. 11, 1907, p. 434.)

COLORADO, HEREFORD & GULF.—Construction is said to have been begun by the Southwest Engineering Co. The line, as projected, is to be 1,500 miles long, connecting Trinidad, Colo.; Hereford, Big Springs, San Angelo, San Antonio and Port Lavaca, Texas. (May 15, p. 687.)

COTTON BELT RAILROAD.—F. R. Durden, Savannah, Ga., writes that this company is being organized in Georgia to build a line from Louisville, Ga., east to a point on the Savannah river, about 40 miles.

DELAWARE & EASTERN.—The Delaware & Eastern Construction Co. was recently organized in New York, with $200,000 capital. The directors are William Sibbert, D. Fleurenstein, of Brooklyn, and William C. Relyea, of New York. The company was probably organized to extend the Delaware & Eastern, which operates a road from East Branch, N. Y., northeast to Arkville, 37½ miles, and is eventually to operate a coal line from Wilkesbarre, Pa., northeast to Syracuse, N. Y. The Supreme Court of New York recently sustained the action of the old New York State Railroad Commission in granting certificates of public necessity and convenience to the Schenectady & Margaretville, which proposes to build the northern extension of the D. & E. from Arkville to Schenectady, 70 miles; also to the Hancock & East Branch to build the southern extension from East Branch to Wilkesbarre, Pa., 160 miles. (May 15, p. 687.)

EASTERN BRITISH COLUMBIA.—An officer writes that this company is asking for bids and that some of the work is now under way on a line from the south fork of Michel creek, B. C., on the Crow's Nest branch of the Canadian Pacific, south 14 miles. Some of the work is heavy, through a mountainous section. D. Corbin, President; E. G. Taber, Chief Engineer, Fernie, B. C. (May 8, p. 655.)

ESQUIMALT & NANAIMO.—See Canadian Pacific.

GLENVILLE & KANAWHA.—It is said that contracts will soon be let for the proposed line from Glenville, W. Va., to Weston, 30 miles. (March 15, 1907, p. 384.)

GREAT NORTHERN.—It is reported that the Crow's Nest branch will be extended from Fernie, B. C., to Calgary, Alb.

James J. Hill is said to have announced to the associated board of trade of Saskatchewan that as soon as the gaps in British Columbia are closed and a line is built to Calgary, it is the intention to build from Winnipeg, Man., now reached from the south by the Great Northern, west to Calgary and also through northern Saskatchewan and Alberta.

HANCOCK & EAST BRANCH.—See Delaware & Eastern.

HARRISVILLE & CORNWALLIS.—Local reports say that construction has begun at Beaver Rock. (May 1, p. 623.)

KNOXVILLE, SEVIERVILLE & EASTERN.—It is said that work will begin before June 15 on the first section from Knoxville, Tenn., to Sevierville, 26 miles, by W. J. Oliver & Co. The proposed line in Tennessee is to be 52 miles long and may be extended into North Carolina. W. A. Seymour, Chief Engineer; C. S. McManus, President.

MISSOURI, KANSAS & TEXAS.—Local reports state that this road will make large expenditures on its Shreveport division for raising grades and improving bridges to avoid damage by flood. J. W. Petheram, Chief Engineer, Dallas, Texas.

NASHVILLE & HUNTSVILLE.—I. L. McCord, of Huntsville, Ala., who has the contract for building this line, is letting subcontracts for grading and surveying. (May 8, p. 655.)

NEW YORK CENTRAL & HUDSON RIVER.—The third track work on the Boston & Albany is well under way and additional forces are soon to be put to work. The section from West Pittsfield, Mass., to Richmond Summit has been graded, and the section between Washington and Hinsdale is expected to be ready for track laying soon. Bids are shortly to be asked for work on other sections as follows: On one mile between mile 198 and Grandview, N. Y.; on one mile eastward from East Greenbush; on a mile and a half westward from Chatham; on three miles between Webster Junction, Mass., and Jamesville, and probably on a mile westward from East Chatham, N. Y. When the section between Hinsdale and Washington is finished there will be a continuous stretch from

North Adams junction to Washington, and when all the work planned between Washington and Rensselaer is done, there will be a continuous third track between the two points, except the following gaps: six miles between Niverville and High Bridge; one and one-half miles on the East Greenbush grade; the stretch through Pittsfield to North Adams junction, and the three miles from Chatham to East Chatham.

The New York Public Service Commission has approved the application of the Boston & Albany for permission to make an issue of 4 per cent. bonds. About $1,200,000 of the proceeds will be spent in the state of New York. This work includes an engine house to be built in East Albany, to cost $300,000, and third tracking part of the road. (May 15, p. 687.)

Oregon Interurban.—Bids were recently asked for building 4½ miles of line from Oregon, Mo., to Forest City. It will require 60,000 cu. yds. of excavation and 47,000 cu. yds. of embankment, and a steel bridge 60 ft. long. P. F. Morgan, President; Geo. Custer, Engineer.

Oshkosh, Winneconne & Waupaca.—Said to have organized, $100,000 capital, to build a line from Oshkosh, Wis., northwest to Winneconne, thence to Waupaca, about 50 miles. E. H. Steiger, W. H. Bray and E. W. Murphy are among the incorporating stockholders.

St. Louis, Bartlesville & Pacific.—It is said that a resurvey has been made on the request of Jackson-Kernan Construction Co., New York, who are financing this road. The new survey is from Miami, Okla., instead of Bluejacket, to Welch, to avoid being too close to the St. Louis & San Francisco. D. H. Rhodes, 213 Fourth street, Joplin, Mo., Chief Engineer.

Salem, Winona & Southern.—Organized in Missouri, with $150,000 capital, by J. D. White, Jefferson D. Riddle, William S. McKinley and others, Winona, Mo.

Schenectady & Margaretville.—See Delaware & Eastern.

Southern Pacific Co. of Mexico.—See Southern Pacific.

Southern Pacific (Mexico).—The new line being built down the west coast of Mexico to Guadalajara, 730 miles, under the name of the Southern Pacific Co. of Mexico, and previously referred to in these columns as the Mexican Pacific coast, has been opened from Navojoa, Sonora, south to San Blas, 83.8 miles.

Southern Utah.—An officer writes that this company expects to soon begin work on its proposed line from Price, Utah, southwest about 20 miles. It has not yet been determined when bids are to be asked for the work. J. H. R. Franklin, President; A. A. Sweet, General Manager; J. F. Williamson, Chief Engineer, Price, Utah. (Nov. 22, p. 636.)

Virginia & Carolina Southern.—Local reports state that this road is preparing to build an extension from St. Pauls, N. C., north to Hope Mills, 12 miles. J. F. L. Armfield, President, and Jerry Respess, Chief Engineer, Fayetteville, N. C.

Winnipeg, Yankton & Gulf.—Organized with $100,000 capital to build 500 miles of line from Superior, Neb., through the western Kansas wheat belt to the southwest corner of the state. Incorporators are said to be millers and grain men of Barton county.

Wisconsin & Northeastern.—Organized, it is said, to build a railroad from Poy Sippi, Wis., southwest to Red Granite, to connect with the Chicago & North-Western. John Moffatt, President; C. A. Benedict, Secretary.

## RAILROAD FINANCIAL NEWS.

Boston & Albany.—The application of this company for permission to issue $7,000,000 25-year improvement 4 per cent. bonds was approved on June 4, by the New York Public Service Commission, Second District.

Cincinnati, New Orleans & Texas Pacific.—Shareholders have been given the right to subscribe to $500,000 preferred stock at par. This will permit each shareholder to take one share for each 10 shares of his present holdings, whether common or preferred.

Delaware & Hudson.—This company has applied to the New York Public Service Commission, Second District, for permission to issue $50,000,000 first mortgage 4 per cent. bonds of 1908-1943. Permission is asked to issue $20,000,000 of these bonds at once, and an additional $6,500,000 to be used to pay existing mortgage debts; the remaining $23,500,000 to be reserved.

Erie.—The New York Public Service Commission, Second District, has authorized the company to issue $1,000,000 bonds on its Buffalo & Southwestern division, second lien mortgage, in order to refund the $1,000,000 5 per cent. bonds of 1895 due July 1, 1908.

Gulf & Chicago.—See Mobile, Jackson & Kansas City.

Illinois Central.—The first train was run into Birmingham, Ala., on May 30. The Mobile & Ohio will run trains into Birmingham over the same tracks as the Illinois Central.

Missouri Pacific.—The directors have decided to omit the semi-annual dividend due June 30. Dividends at the rate of 5 per cent. per annum were paid from July, 1901, to January, 1908, but the payment last January of 2½ per cent. was made in stock. In making the announcement the directors added that they thought it a conservative policy not to pay the dividend at present, although the earnings would justify a continuance on the 4 per cent. basis.

Missouri River & Northwestern.—J. L. Soule, Superintendent, writes that, effective May 19, this property was placed in the hands of C. O. Bailey, Sioux Falls, S. Dak., as sole receiver, and a decree was entered ordering the property sold on June 22 at an upset price of $350,000.

Mobile, Jackson & Kansas City.—It is reported from Jackson, Miss., that all details have been completed for the consolidation of the Mobile, Jackson & Kansas City and the Gulf & Chicago, and that the new company will be known as the New Orleans, Mobile & Chicago.

New Orleans, Mobile & Chicago.—See Mobile, Jackson & Kansas City.

New York Central & Hudson River.—This company has applied to the New York Public Service Commission, Second District, for authority to transfer from the Mohawk Valley Company to a street railway corporation the interests of the New York Central & Hudson River, and the Central Railway Syndicate in the street railway companies in Rochester, N. Y., Syracuse, Utica and Schenectady. This would bring the street railways under the supervision of the Public Service Commission, Second District.

Norfolk & Ocean View.—This road was formerly the Bay Shore. C. P. Breese has applied for the appointment of a receiver.

Oklahoma Central.—Judge Campbell, of the United States Circuit Court, sitting at McAlester, Okla., has appointed Asa E. Ramsay, cashier of the First National Bank of Muskogee, Okla., receiver of this road, and N. A. Gibson, an attorney at Muskogee, receiver of the Canadian Construction Co., which built the road. This action was taken on the application of the Western Trust & Savings Bank, Chicago, which holds for itself and as trustee $2,900,000 of the $3,000,000 bonds of the road.

Pittsburgh, Cincinnati, Chicago & St. Louis.—See Pennsylvania Lines West.

Union Pacific.—Kuhn, Loeb & Co. are offering for subscription at 95½ $50,000,000 first lien and refunding mortgage 4 per cent. bonds of the Union Pacific, due June 1, 2008. Details of the offering are given in the advertising columns, page 73.

Western Maryland.—Arrangements have been made for extending the time for payment of the company's loans and for the postponement of the sale of George's Creek & Cumberland stock held as collateral.

Pennsylvania Lines West.—Speyer & Co. and Kuhn, Loeb & Co. have purchased $6,000,000 consolidated mortgage 4 per cent. bonds of 1907-1957, of the Pittsburgh, Cincinnati, Chicago & St. Louis. These bonds are guaranteed by the Pennsylvania Company.

Wheeling & Lake Erie.—B. A. Worthington, of Pittsburgh, Vice-President and General Manager of the Wabash lines east of Toledo, Ohio, was appointed, on June 8, receiver of the Wheeling & Lake Erie. The road was put into the hands of a receiver on account of claims aggregating $8,791,047, due the National Car Wheel Company, of New York.